

# Fourth Annual Undergraduate Research & Scholarship Conference 2007

Student Union Building  
**April 16, 2007**  
1:00 p.m. – 4:00 p.m.

## Schedule of Events

Poster Session	1:00 – 4:00 pm	Jordan Ballroom
Art Display	1:00 – 4:00 pm	SUB Gallery, 2nd Floor
Podium Presentations	1:00 – 3:00 pm	Barnwell, Brink & Cataldo
Speakers and Awards	3:30 pm	Jordan Ballroom

Bob Kustra, President

Sona K. Andrews, Provost

Mark Rudin, Vice President for Research

Sharon McGuire, Associate Vice President for Undergraduate Studies





Welcome to Boise State University's Fourth Annual Undergraduate Research and Scholarship Conference. This conference provides undergraduate students at Boise State an opportunity to share their research projects and be recognized for their exceptional work.

Allow me to be the first to congratulate those students who have been selected as a part of this important event. The faculty sponsors who assist and support these students with their research have good reason to feel proud. These faculty members should also be commended for their commitment to learning and their dedication to the personal success of our students. The projects being presented span an extensive range of subjects. No two are alike; each project reflects the efforts of our faculty and students toward the betterment of our university, community and state through academic research and exploration.

Previous conferences have left an impressionable legacy at Boise State. As President, I am committed to supporting the process of discovery and research at all levels of the University, and I will continue to encourage growth in research opportunities and activities as part of the undergraduate educational experience at Boise State.

I hope you enjoy the conference and thank you for your support of this annual event.

Warm regards,

A handwritten signature in cursive script, reading "Bob Kustra".

Bob Kustra



Welcome to the Fourth Annual Undergraduate Research and Scholarship Conference. Our institutional strategic plan, Charting the Course, has defined student involvement in research as one of the hallmarks of Boise State University defining itself as a Metropolitan Research University of Distinction.

Our students participating in today's conference represent the diverse range of academic disciplines at Boise State University. They have each demonstrated a drive and determination that exceeds that of the average student. Through their hard work, they have gained research and presentation skills that will prepare them for the world beyond academia. It is with great pride and enthusiasm that I congratulate these exceptional students and honor them for their outstanding work.

I would also like to extend my appreciation to our faculty sponsors. Their dedication to enriching the learning environment at Boise State University is another testament to our vibrancy and growth. We thank them for their commitment to our students

and for creating opportunities for scholarly achievement.

For those of you joining us today, I encourage you to visit all of the venues represented and meet with our students to learn about the research and work they have conducted. You will not be disappointed. On behalf of Boise State University, I thank you for your support and hope that you enjoy this year's conference.

Sona Karentz Andrews

## 1:00 PM – 2:00 PM BARNWELL ROOM

Each podium presentation will be 10 - 15 minutes with a 5 minute transition between presentations. Feel free to come and go within the hour-long session.

### LOWER EXTREMITY MECHANICS DURING CUTTING TASKS IN DIFFERENT SHOE-TURF COMBINATIONS

*Rafael Garcilazo (McNair Scholar),  
Department of Mechanical & Biomedical  
Engineering; College of Engineering  
Faculty Sponsor: Michelle Sabick*

The demands placed on the lower extremity when performing jumping and cutting maneuvers are depending, in part, on the interaction between the playing surface and the athlete's footwear. Higher demands are likely to result in increased incidence of injury, so for safety reasons it is important to quantify how the shoe-turf interface affects joint loads. The purpose of this study is to compare the forces on the lower extremity while landing and side cutting (rapid direction change at approximately 45 degrees) on artificial football turf with different styles of football cleats. The forces on the lower extremity were compared by using the ground reaction forces acting on each leg with two different styles of football cleats. From this data collected I will be able to determine which footwear causes the greatest loads on the lower extremity.

### PERCEPTIONS OF POSITIVE RELATIONSHIP TRAITS IN GAY AND LESBIAN COUPLES

*Miki Skinner (McNair Scholar) and Sancheen  
Collins (McNair Scholar), Department of  
Psychology; College of Social Sciences & Public  
Affairs; Faculty Sponsor: Mary Pritchard*

The current research examined perceptions of the positive relationship traits of commitment, satisfaction, investment, and closeness in homosexual relationships. Previous research has shown that, in general, gay and lesbian relationships are no less satisfying, close, or well-adjusted than are heterosexual relationships. However, this may not be the commonly held view among the general populace, and may also differ in regards to perceptions of gay males as opposed to lesbians. Also, certain subgroups within the American culture, such as individuals in the helping professions, are expected to be less biased in their views towards others. In order to examine these question, students (n = 216) and professional counselors (n = 96) read one of three variations of a transcript of a couple's counseling session that were identical in all aspects except for the names of the couple members, implying sexual orientation (either John and Amy, Amy and Jennifer, or John and David). Participants then rated the couple's level of commitment, satisfaction, investment, and closeness. Surprisingly the student group perceived no differences between the couples, but the counselor group perceived the gay and lesbian couples as having higher levels of the positive relationship traits.



## IDENTITY AND RHETORICAL ANONYMITY VIA THE INTERNET

*Nicolas Wynkoop, Department of  
Communication; College of Social Sciences and  
Public Affairs; Faculty Sponsor: Natalie Nelson  
Marsh*

It is often assumed that the rhetorical processes of communication aim to create symbolic connection. I examine this assumption with regard to communication contexts created by the Internet, especially such public communication websites as MySpace.com and Facebook.com. I note communication aspects that make these contexts significant, such as asynchronous interactions and the opportunity for regulation of the anonymity of communicators. From these characteristics, I explore the careful crafting and management of identities through rhetorical communication and how this crafting often involves intentional ambiguity, even extending to false representation of one's self and role-playing. This is amplified by low requirements for friendship, and a seemingly vast number of readily available, similar, and replaceable contacts. These concepts lead to communication which, rather than simply aiming to connect, seeks to balance autonomy and connection in the identity.

**2:00 PM – 3:00 PM**

## **BARNWELL ROOM**

Each podium presentation will be 10 - 15 minutes with a 5 minute transition between presentations. Feel free to come and go within the hour-long session.

## SYMMETRIES IN STICK KNOTS

*Heather Flynn, Department of Mathematics;  
College of Arts & Sciences  
Faculty Sponsor: Uwe Kaiser*

Knot theory is the mathematical study of closed curves in three-space. Particularly interesting are a special class of knots known as stick knots. Unlike the generic knot, stick knots are formed using only rigid sticks, and as such, their nature has special implications concerning molecular structures. In our research, we introduce a new invariant on stick knot presentations called a "skew sequence." We use Eric Rawdon's computer generated 3D knot models, along with our concept of skew sequences, to gather and analyze numerical information about stick knots. Additionally, the geometric meaning of the skew sequence is explored. We conjecture that skew sequences might play a role in determining or creating "minimal stick knot projections," i.e. projections of given knots using the smallest amount of sticks possible.

### ALCOHOL INTAKE IN RELATION TO IMPULSIVITY, STRESS LEVEL, AND DEPRESSION IN 18 – 24 YEAR OLDS IN IDAHO

*Brett Hearl and Janel Allison, Department of  
Nursing; College of Health Sciences  
Faculty Sponsor: Lee Hannah*

Alcohol use and the associated negative consequences represent a significant problem for youth in the United States. Data collected previously through the Young Adults in the Workplace Grant was analyzed to examine the relationship between alcohol consumption and impulsive behavior, stress and depression levels in 18 to 24 year olds in the state of Idaho. Participants were asked a series of alcohol related questions including frequency of binge drinking. The variables of stress level, impulsivity, health status, and depression levels were used to assess a correlation between those variables and the participants' likelihood to binge drink. 193 (61%) participants were included in the data analysis. Of the 193 participants, 81 (42%) report binge drinking. Our results showed there was a statistically significant relationship between binge drinking and overall health (p-value = .036). More research needs to be conducted on why young individuals binge drink and how it affects their lives.

### HORSE OWNERS ATTITUDES AND PERCEPTIONS REGARDING WEST NILE VIRUS

*Benjamin Tverdy, Stephanie Wood, Aaron  
Gibbons, and Zach Raptosh, Department of  
Health Studies; College of Health Sciences  
Faculty Sponsor: Lee Hannah*

This study was conducted to assess the attitudes of horse owners regarding West Nile Virus (WNV). A literature review was performed and prior surveys were reviewed. Three methods were used to distribute surveys to horse owners in western Ada and eastern Canyon counties:

- 1) door-to-door delivery of paper surveys attached to self-addressed stamped envelopes,
- 2) collection boxes in horse boarding facilities, and 3) delivery of surveys to their clients by participating veterinarians during visits. Overall, 200 surveys were distributed and 97 (49%) returned. Mean age group of respondents was 31 – 55 years. Results showed that 100% of respondents had heard of WNV. On average, horse owners learned about the disease 2 – 3 years ago. 89 (92%) of respondents reported having a regular veterinarian. Likelihood of having a vaccinated horse was significantly associated with self-reported level of concern about WNV and reporting riding their horse(s) four or more times per week.

## Podium Presentations

**1:00 PM – 1:45 PM**

### **CATALDO ROOM**

Each reading will be approximately 7 minutes. Feel free to come and go within this session.

#### **PRESIDENT'S WRITING AWARDS**

*Students will read sections of their winning entries College of Arts & Sciences  
Faculty Sponsor: Carrie Seymour*

The President's Writing Awards originated over twenty years ago for the purpose of promoting and rewarding student academic writing. Over the past two decades, the contest has awarded prizes for a diverse selection of student essays in a number of different categories. Though largely funded by the English department, the contest solicits and encourages submissions from academic departments across the curriculum. Categories are carefully chosen each year to include many types of academic writing, including critical analysis, research reporting, and technical writing. We have also had specialized categories sponsored by various departments including Spanish, Business, and Education. Ultimately, the contest gives students a chance to highlight the work, both creative and research-based, that they have worked on during their academic careers in their specific disciplines. As the contest continues to grow we hope to see more and more types of research writing from as many departments as possible so that we can highlight the excellent work being done by students at Boise State University.

**2:00 PM – 3:00 PM**

### **CATALDO ROOM**

Each podium presentation will be 10 - 15 minutes with a 5 minute transition between presentations. Feel free to come and go within the hour-long session.

#### **LOCAL REVENUE: MAKING A DIFFERENCE IN COLLEGE READINESS**

*Christian Busnardo (McNair Scholar),  
Department of Curriculum, Instruction, and  
Fundamental Studies; College of Education  
Faculty Sponsor: Philip P. Kelly*

This research project collects demographic, fiscal, and assessment data from Idaho school districts that have a high school and that report senior ACT scores. Analysis of the data indicates statewide correlations between local economic revenue indicators (local revenue per student, household median income, and percentage of local funding per student) and Idaho high school graduating seniors' composite ACT scores. This research project indicates: (1) A strong relationship between Idaho school districts' local revenues and their seniors composite ACT scores; (2) A strong relationship between Idaho high schools amount of local revenue per student and minimal ACT benchmarks not met by graduating seniors; and (3) A strong relationship between local revenues, ACT scores, and the percentage of college prep/advanced placement courses taught in Idaho high schools.



### HAWTHORNE'S "GERMINOUS SEEDS": MELVILLE'S MARGINALIA IN MOSSES

*Andrea Johnson, Department of English;  
College of Arts & Sciences*

*Faculty Sponsor: Steven Olsen-Smith*

As a key literary figure in nineteenth-century American literature, Herman Melville (1819-1891) wrote during a period known as the American Renaissance, when writers sought to create a new national literature. Melville's whaling epic, *Moby-Dick* (1851), represents his efforts to reinvent the form of the novel—which has strong British affiliations—into a genre known as the romance. In 1850, during the composition of *Moby-Dick*, Melville met like-minded author Nathaniel Hawthorne (1804-1864). Hawthorne's influence led to drastic revision of *Moby-Dick*, which resulted in its presently-known version. A neglected resource—Melville's marginalia in Hawthorne's collection of short stories entitled *Mosses from an Old Manse* (1846)—reveals Melville's interest in dark themes that Hawthorne explores, such as flawed humanity and its inability to transcend opposition. Curious similarities between Hawthorne's *Mosses* and Melville's *Moby-Dick* may be linked to the interest expressed in specific passages with Melville's annotations, markings, and other marginalia sigla.

### GENERATIONAL TRANSITION OF SUBSISTENCE FISHING PRACTICES IN THE PACIFIC COMMUNITY OF VENADO ISLAND, COSTA RICA

*Maria Venegas (McNair Scholar), Department  
of Anthropology; College of Social Sciences &  
Public Affairs; Faculty sponsor: Robert McCarl*

Globalization has transformed the subsistence economies of Costa Rica's coastal fishing communities. These small, resource-based communities are particularly vulnerable to structural changes in the Costa Rican economy. The people in these communities employ traditional techniques such as the use of fishing rods, tackle, throw and drag nets. This ethnographic study examines the cultural response in the small-scale fishing community of Venado Island to changes from subsistence fishing to tourism and the changing nature of land rights. The goal of this ethnographic study is to document the way that tourism has affected the subsistence fishing activities in the island. A key question is how tourism forced the residents of Venado Island to make choices between a traditional economy and the need to survive in an expanding global market of ecological tourism. I hope that this research will create a better understanding of the cultural impact of global change on the people of Venado Island, as well as a wider appreciation of their rights and perspectives in this rapidly changing region of the Americas.

1:45 PM – 3:00 PM

### BRINK ROOM

Each podium presentation will be 10 - 15 minutes with a 5 minute transition between presentations. Feel free to come and go within the hour-long session. These presentations will be in Spanish.

#### LA PALABRA BILDUNGSROMAN CON RELACION A LOVING PEDRO INFANTE

*Spryte E. Heithecker, Department of Modern Languages and Literature – Spanish;  
College of Arts & Sciences  
Faculty Sponsor: Fàtima Cornwall*

This essay is an analysis of the book Loving Pedro Infante by Denise Chavez. It explores the development of the main character, Tere, through the use of the literary concept *Bildungsroman*. As the protagonist progresses through during a difficult time in her life, there is a development of the heroine which in this case is Tere. The novel reveals three phases: from the beginning when Tere can't stand up for herself when it comes to men, the middle when she has a fight with her best friend that sets forth a change in her attitude, and the ending when she is perceived by the reader to be a heroine because she can stand up for herself and has a new attitude about her life. As part of this character analysis, the essay also explores the relationship between the male machismo attitude and the changing reactions to different situations by Tere.

#### LOS ASPECTOS AUTOBIOGRÁFICOS EN CANÍCULA SNAPSHOTS OF A GIRLHOOD EN LA FRONTERA

*Michael Price, Department of Modern Languages and Literature – Spanish;  
College of Arts & Sciences  
Faculty Sponsor: Fàtima Cornwall*

This research paper examines this work by Norma Elia Cantú and shows how she blends different writing genres on purpose to make her readers carefully analyze her work. It also compares her work to other authors and shows how there is a new tendency to blend genres as almost a new writing style. Cantú uses this genre blending to show how everyone's memories, how they remember things, and their views on passed events are full of discrepancies. We don't remember things exactly how they happened, our stories change over time. The Author then makes a connection between our memories and the Borderlands. They are lands where many cultures, memories, and ways of life are blended together and create a world of truth and fiction.

CANÍCULA: UN GÉNERO DE SÍ MISMO  
(CANÍCULA: A GENRE OF ITS OWN)

*Kali Rosendin, Department of Modern  
Languages and Literature – Spanish;  
College of Arts & Sciences; Faculty Sponsor:  
Maria Alicia Garza*

This research paper explores all of the possible genres encompassed by *Canícula* by Norma Elia Cantú. It insists that the book can not be read only as one, and that if all of its applications are not considered, much of its meaning is lost. The findings reveal three major genres: autobiography, fiction, and ethnography. It describes what would traditionally be expected of a book in each of these three areas, and then measures *Canícula* up to each. None of the categories are a perfect fit in and of themselves, but the book boasts strong elements of each, as further evidenced by various literary journalists who are referenced. *Canícula* is part of a new generation of literature in which the old dividing lines of genre are broken, along with other outdated literary rules.



### PROGRAM COVER DESIGN: UNDERGRADUATE RESEARCH AND SCHOLARSHIP CONFERENCE

*Ferijala Balic, Brett Baltzer, Joerg Boettiger, John Briggs, Megan Britton, Melissa Charounlertdajkul, Sean Cross, Derek Edgar, Cody Evans, Melissa Harris, Violeta Ilieva, Sarah Gridley, Jennie Jorgensen, Sean Kern, Tamar King, Katie Luke, Melissa Martin, Jade McCoy, Megan Miller, Jayme Montoya, Andres Morales, Seth Myers, Steve Norell, William Oberleitner, Amanda Parks, Tonya Power, Anne Reynolds, Laura Sanders, Marie Smartt, John Smith, Clinton Stonich, Kyle Struchen, Sarah Talbert, Scott Viafore, Aubry Watkins, John Wells, and Theresa Worl, College of Arts & Sciences, Department of Art; Faculty Sponsors: John Francis and Jennifer Wood*

Students in Art 204, Graphic Design Studio II were presented with a unique opportunity to design the program cover for the 2007 Undergraduate Research and Scholarship Conference. This is an example of a research project for a graphic designer. The student designers prepare themselves by researching the university colleges and many programs that are represented in the conference. Class instruction includes subjects in representation, semiotics and denotation of images as a way to present the concept for communication. Through use of peer and instructor review, each student developed their own design as a way to visually represent the conference. Some designers used metaphoric principles, others by use of a visual pun while some tried to capture the essence of the undergraduate research experience. This year's cover design was selected by a jury of graphic design faculty and conference

personnel. Each cover design submission is displayed in the Student Union Building Gallery for the duration of the conference.

### PRESSING FORWARD: AN EXPLORATION IN PRINTMAKING

*Colleen DeBolin, Brandon Maxwell, Amy Nack, O.C. Earnest Goleman Jr. III, Denise Lauerman, and Tiffany Kimball; College of Arts & Sciences; Faculty Sponsor: Jill Fritterer*

The art of printmaking is a complex genre that has evolved and responded through the ages to include an assortment of techniques and methods. Printmaking's origins began in the middle ages and have continued to progress and develop into a dynamic art form. Originally, the ability to produce multiple images with ink on paper has allowed the prints to work as a system of mass communication.

Today it is a fine art discipline where artists can communicate their diverse perspectives of the world, while utilizing the variety of techniques unique to the printmaking practice. The artists in this research project will exhibit pieces that include intaglio, relief, screen printing, monotype and lithographic techniques. Each artist has provided documentation of their work, accompanied by a discussion of the origins of the processes employed, and how the medium informs and influences their pieces.

EXPERIMENTAL TYPOGRAPHY:  
REPURPOSING THE CLOCK

*Amanda Parks, Joerg Boettiger, Maria Kauffman, Bradley Kindall, Melissa Martin, Joseph Murgel, Josie Newton and Tom Volk, Department of Art: Graphic Design College of Arts & Sciences Faculty Sponsor: John Francis*

This project was from a special topics course taught in advanced typography. The concept behind the course and the projects was for the students to use their foundation of traditional typography as a basis for informed rule breaking. After class readings on some of the key ideas of postmodernism – origins, deconstruction, appropriation, technology, authorship and opposition, the first project a clock design was assigned. The project was framed by the question how might a common object (the clock) be re-purposed or transformed to take on new meaning? Students were asked to consider several possible directions for the project. Our design direction might be based on an expressive re-contextualizing of the signs found on a clock or by using a totally different set of signs. In the clock's design we could create a new meaning for the clock, where telling time must be a secondary consideration.

THE ATLANTA PROJECT

*Christopher Sagan, Department of Art; College of Arts & Sciences; Faculty Sponsor: Tudor Mitroi*

Over the past year and a half, I have been interested in the idea of how humans encroach on nature and how humans change and affect the natural world. Eight months ago I became aware of a

potential environmental disaster in our local area. This issue is the proposed gold mine near the town of Atlanta, Idaho that could potentially expose a majority of the drinking and agricultural water of our area to cyanide poisoning among other hazardous chemicals. I decided to explore this issue in my art work in some of my upper level classes. I start my research with the local newspapers, the Idaho Statesman, Boise Weekly, and Thrive; in these places I can find my initial articles and information. From there I have looked to the Sierra Club, Idaho Conservation League, and Boise Rivers United, all respected conservation and preservation groups, also local, state and national government offices and agencies, and the actual companies responsible for the mine. Adding to all of this research, which encompasses about sixty different sources, I am also using personal photographs and drawings that I have produced from my travels in the area of question.

I have also been studying the practices of other companies and mining operations around the world and the chemicals and processes they use, to try and better understand the nature of the situation. In addition to numerous factual and hardcopy information I am also researching numerous visual references and sources. These visual references ranged from photos of mining operations from their beginning to their end. I am researching images of the products, the development of mine sites, equipment used, and waste products and how they are disposed of. I am also looking at several other artists who deal with similar subjects and how they have dealt with these issues visually.

## NITROGEN AGGREGATION IN DIAMONDS FROM THE STAR DIAMOND MINE, SOUTH AFRICA

*Cassie Anderson, Department of Geosciences  
Faculty Sponsor: Mark Schmitz*



Single nitrogen atoms can substitute into the diamond crystal lattice during normal crystallization processes. Nitrogen atoms can migrate and combine to form nitrogen defects, dependent upon the mantle residence time, mantle residence temperature, and total nitrogen concentration

of the diamond crystal. Nitrogen defects are thus a record of the thermal history of the diamond. This study looked at a suite of diamonds from the Star Mine, South Africa. Using high resolution FTIR spectrometry we obtained multiple spectra from single crystals and deconvolved each into component defect signatures. Using a semi – automated procedure to process the deconvolutions, we found a consistent pattern of decreasing nitrogen concentrations and aggregation states, and uniform temperature estimates from core to rim of each crystal, supporting the assumption that the diamond crystallized and then resided in the mantle at a relatively constant temperature for approximately 3 billion years.

## A “CALCULATOR” FOR MATHEMATICAL PROOFS

*Nathan Bailey, Department of Mathematics  
Faculty Sponsor: Randall Holmes*

One of the great frustrations in formalizing mathematics is the difficulty and tedium associated with deriving theorems. The process of extracting a formal theorem by hand is comparable in difficulty to doing long division by hand. Fortunately, the tedious part of this can be mechanized into a program, allowing the student/researcher to concentrate on the real problem. This research project involves formalizing the ordered field axioms into sequent calculus using a program called Marcel. Next, I use these axioms in Marcel to prove some standard results and theorems. This process has a threefold effect:

- 1) The software is still under development, so the “bugs” are located through this rigorous testing.
- 2) The software interface is tested for usability, and the necessary changes are incorporated to make the software faster and more user friendly.
- 3) The usefulness of the software as a research and pedagogical tool are demonstrated.

## BACTERICIDAL EFFECTS OF METAL OXIDE NANOPARTICLES ON GRAM POSITIVE AND GRAM NEGATIVE BACTERIA

*Jason Bell, Madhu Kongara, Isaac Coombs,  
Hua Wang, Cory Hanley, Alex Punnoose,  
Denise Wingett, Department of Biology  
Faculty Sponsor: Kevin Feris*

Increased environmental presence of nanoscale metal oxides and indications of



their toxicity suggest that understanding of that toxicity is urgently needed. We have initiated studies to characterize nanoparticle bacterial toxicity. *Escherichia coli* and *Staphylococcus aureus* were treated with 9 nm zinc oxide (ZnO) nanoparticles to assess bactericidal versus bacteristatic effects. To determine at what [ZnO] effected growth both organisms were plated on media containing from 0.25  $\mu$ M to 5.0  $\mu$ M [ZnO]. Exposure time needed to induce toxicity was determined by culturing *S. aureus* with 0.5 mM and 2.0 mM [ZnO], *E. coli* with 1.0 mM and 5.0 mM [ZnO], and sampling cultures at 3, 6, 12, 24, 36, 48 hours. 5.0 mM [ZnO] induced 80% cell death for *E. coli* after 3 hours and 100% cell death after 36 hours. 2.0 mM [ZnO] induced 80% cell death for *S. aureus* after 3 hours and 100% cell death after 12 hours.

#### POSSIBLE TOXICITY MECHANISMS OF METAL OXIDE NANOPARTICLES ON PSEUDOMONAS AERUGINOSA DUE TO LIPOPOLYSACCHARIDE VARIABILITY

*Jason Bell, Madhu Kongara, Isaac Coombs, Hua Wang, Cory Hanley, Alex Punnoose, Denise Wingett, Department of Biology*  
Faculty Sponsor: Kevin Feris

Recent indications of nanoscale metal oxide toxicity and their increased presence in the environment suggests that an understanding of that toxicity is urgently needed. Our previous studies demonstrated bactericidal affects of zinc oxide nanoparticles (ZnO NP) on *Escherichia coli* and *Staphylococcus aureus*. In this study, four strains of *Pseudomonas aeruginosa*, A<sup>+</sup>B<sup>+</sup>, A<sup>+</sup>B<sup>-</sup>, A<sup>-</sup>B<sup>+</sup>, and A<sup>-</sup>B<sup>-</sup>, were treated with varying concentrations of 9 nm sized ZnO NP to explore toxicity mechanisms. Strains differ

in the charge of the lipopolysaccharide outermembrane, differences between strain viability are assumed to be due to lipopolysaccharide compo sition. Strains were plated on LB with between 0.25 mM to 10.0 mM [ZnO]. A<sup>-</sup>B<sup>+</sup> strain grew on media containing up to 1.0 mM [ZnO], while the other three strains grew on media containing up to 3.5 mM [ZnO]. Therefore the net negatively charged lipopolysaccharide layer of A<sup>-</sup>B<sup>+</sup> appears to increase cell susceptibility to ZnO.

#### DEVELOPMENT OF A HIGH-SPEED ATOMIC FORCE MICROSCOPE

*Jeremy Bonander, Department of Chemistry*  
Faculty Sponsor: Ken Cornell

Atomic Force Microscope (AFM) is a versatile instrument that has advanced to become a popular tool for many different fields of study. AFM's ability to image biological samples in their native fluid environment gives AFM a distinct advantage over many of the other imaging techniques such as X-ray crystallography and electron microscopy. Development of a high-speed AFM will give video images of biological molecules in their aqueous native environment on a physiological relevant time scale. In this research we have developed a new technique to increase the speed of the AFM. A small piece of bimorph material is used to control the z direction movement instead of the normal piezo tube under a force feedback during data acquisition. This reduces the mass which gives a higher resonance frequency and ultimately higher speeds. Our current imaging speed is 10 frames per second making it 2000 times faster than commercially available AFM.

### DESIGNING NEW DRUGS TO FIGHT BEAVER FEVER

*Jeremy Bonander, Department of Chemistry  
Faculty Sponsor: Ken Cornell*

*Giardia intestinalis* causes one of the most common parasitic diseases on the planet. New drugs targeting essential parasitic processes are needed to help combat this disease. *Giardia* 5'-methylthioadenosine nucleosidase (MTN) is an attractive target for antibiotic development since it is unique to microbes and occupies an essential step in the salvage of methionine and purines that the parasite cannot make by itself. The gene for *Giardia* MTN (giMTN) was amplified and expressed as a hexahistidine tagged recombinant protein. Currently enzyme kinetic and inhibitor studies are underway to characterize GiMTN substrate specificity and inhibition profiles. Experiments are planned to examine the effect of MTN inhibitors on *Giardia* growth in vitro.

### LENDING A HELPING HAND

*Derek Christensen, Department of English;  
Faculty Sponsor: Thomas Peele*

This poster displays the results of innovative research and document design, carried out by first-year students, who created brochures that are currently in use at non-profit agencies. Small groups of students interviewed agency directors to discover the kind of document the agency needed, searched Albertson library to find other works in this genre, and created the documents using a variety of software programs. One group made a tri-fold for the Hillcrest Elementary library. It consisted of study tips and test taking skills. The second group made a bilingual, informational brochure for community members who wish to join the

High School Equivalency Program Students also converted their documents to Web sites; these sites serve as models for agencies and other students. Other undergraduates would benefit from this presentation because it would show them that service-learning really helps students, helps the community, and is also fun.

### SYNTHESIS AND CHARACTERIZATION OF A FIELD-PORTABLE ARSENATE SENSOR

*Taylor Dixon, Department of Chemistry  
Faculty Sponsor: Dale Russell*

To create a novel method of detection of arsenic in groundwater, a preliminary chemical procedure has been developed to produce a molecularly imprinted polymer (MIP) based on dibasic arsenate ions ( $\text{HASO}_4^{2-}$ ). The monomer-template complex has been primitively prepared through several derivatizations of cyclopenta[2,1-b;3,4-b']dithiophen-4-one (CPDT-one), lastly involving a reaction of chlorinated CPDT with arsenate ions. Current research is focused heavily on the purification, isolation, and spectral characterization of the reaction intermediates, so as to provide an ideal complex for subsequent electrode deposition. We are also in the process of optimizing the parameters for oxidative electropolymerization of the arsenate complexes out of acetonitrile (MeCN) + tetrabutylammonium hexafluorophosphate (TBAHFP). Formation of the final MIP will involve a template stripping mechanism, potentially acid hydrolysis of the C-OAs bonds, leaving polymer pockets that are geometrically and chemically selective to arsenate. The MIP-modified electrodes will then be tested for response to arsenate in solution.

### DICHLOROPHENE INHIBITORS OF HUMAN CARBONYL REDUCTASE

*Christopher Ewing, Department of Chemistry;  
Faculty Sponsor: Henry Charlier Jr.*

Anthracyclines are widely used chemotherapeutic agents. The reduction of anthracyclines in the cell is linked to the cardiotoxicity often observed in patients after treatment. The risk of cardiotoxicity is increased with increased dosage. Cardiotoxicity severely limits the use of anthracyclines. Creation of the cardiotoxic anthracycline metabolite is catalyzed by NADPH dependent human carbonyl reductase (HCBR). Inhibition of HCBR in conjunction with anthracycline treatment could potentially decrease the risk of cardiotoxicity. Recently our laboratory has discovered a class of inhibitors which possess two substituted phenyl rings linked together by a carbon or sulfur bridging atom. One such inhibitor is dichlorophene. It has an IC<sub>50</sub> value of 50  $\mu$ M indicating that it is a poor inhibitor of HCBR. Characterization of this inhibitor will be reported. Knowledge of the mechanism of inhibition can be used to inform the design of more potent inhibitors.

### GRAIN SIZE ANALYSIS OF BASALTIC TEPHRA AT SINKER BUTTE VOLCANO, WESTERN SNAKE RIVER PLAIN, IDAHO.

*Michelle Gordon, Department of Geology;  
Faculty Sponsor: Craig White*

A thick section of phreatomagmatic tephras is well exposed in the walls of the Snake River canyon near Sinker Butte. The lower part of this section contains a sequence of gray colored tephras which were previously interpreted as having formed in a shallow fresh water lake. This project provides the first detailed analysis of the grain-size characteristics of these deposits and integrates these data with field observations to better understand how the tephras were deposited. A total of 10 samples were collected from two exposures containing rocks with a variety of different bedding characteristics. Statistical measurements for grain size data for each Tephra unit were obtained through calculations and graphical methods. In general the samples taken from the lower section have sorting characteristics of being primary pyroclastic deposits. The samples taken from the higher sections appear to be reworked by fluvial or eolian processes.



### AN AFM-FET BIOSENSOR FOR PROTEOMIC SCREENING

*Joe Holmes, Department of Physics;  
Faculty Sponsor: Byung Kim*

The Atomic Force Microscope (AFM) and Field-Effect Transistor (FET) technology were integrated into one functioning biosensor for the use of measuring single molecular interactions between proteins. The AFM-FET biosensor has advantages over current drug screening techniques, since it is faster and records single interactions accurately. Using AFM force-spectroscopy, a flexible PEG cross-linker with the protein biotin, was attached to the AFM cantilever. The PEG cross-linker reduced steric hindrance between the biotin and its ligand called avidin, which was tightly bound to the palladium gate surface of the FET. The measurements were made by approaching the cantilever with biotin towards the avidin located on the FET. After contact, the AFM retracted the biotin and the unbinding data was recorded by AFM as force vs. distance and the FET as current vs. distance. The affinity of the receptor system was judged via chemical potential and rupture force.

### ANTIBIOTIC DESIGN TARGETING BACTERIAL METHIONINE SALVAGE

*Chelsea Isom, Department of Chemistry;  
Faculty Sponsor: Ken Cornell*

The methionine salvage pathway presents several unique targets for antibiotic development. This pathway is of interest because the catabolism of the nucleoside 5' Methylthioadenosine to Adenine and Methylthioribose-1-phosphate is accomplished by two unique enzymes in bacteria, whereas

mammals use a single enzyme. The genes for two *Klebsiella pneumoniae* enzymes, 5' Methylthioadenosine/ S-Adenosylhomocysteine nucleosidase (MTAN) and 5-Methylthioribose kinase (MTRK) were amplified, expressed, and purified as hexahistidine tagged recombinant proteins. Kinetic data was obtained for each enzyme, and a series of transition state inhibitors investigated that yielded picomolar  $K_i$  values. Nucleosidase and kinase inhibitors were tested against *Klebsiella pneumoniae* and produce decreases in both biofilm formation and growth.

### USING SIRNA TO MODIFY THE PRODUCTION OF OSM IN MAMMARY CANCER CELLS IN VITRO

*Kelly Katula, Department of Biology;  
Faculty Sponsor: Cheryl Jorcyk*

Oncostatin M (OSM) is a cytokine of the interleukin-6 family that exhibits pleiotropic effects in the human body. OSM has been shown to have stimulatory and inhibitory effects on cell proliferation, both on normal and neoplastic cells in culture. Malignant neoplasia (cancer) is a situation where cellular proliferation controls have been mutated or lost. Previous studies suggest that while OSM inhibits proliferation of mammary tumor cells, OSM may actually promote tumor metastasis *in vivo*. Small interfering RNAs (siRNAs) are utilized by scientists to reduce the transcription of a particular mRNA, leading to the reduction in the expression of a specific protein. The work presented here will involve the production of genetically-modified cell lines to monitor the reaction of mammary cancer cells expressing a lower level of OSM. These cells will be used as reagents in exploring

the relationship between OSM and tumor growth and metastasis.

### CLONING HUMAN, RABBIT, AND RAT CARBOXYL REDUCTASE GENES

*Tamara Kelly, Department of Chemistry;  
Faculty Sponsor: Henry Charlier, Jr.*

Daunorubicin and doxorubicin are anthracyclines widely used to treat a variety of cancers. Metabolism of these anthracyclines in human heart has been connected to the development of a potentially cardiotoxic side effect. Similar observations were made in clinical models designed in rabbit and rat. Several studies suggest that NADPH-dependent carboxyl reductase is responsible for conversion of the parent anthracyclines to the cardiotoxic metabolites. Therefore, it is hypothesized that the enzyme, carboxyl reductase represents a potential therapeutic target through which anthracycline cardiotoxicity may be controlled. To date, very little work has been done with carboxyl reductase from the heart tissues of human, rabbit, and rat. In order to facilitate their study genes from each are in the processes of being cloned for eventual expression in bacteria. Progress on this project will be reported.

### THE INFLUENCE OF ENSO AND AO ON IDAHO'S SNOWPACK

*Mel Kunkel, Department of Geosciences;  
Faculty Sponsor: Jennifer Pierce*

Twenty-five plus years (~1980-2006) of data from 160 SNOTEL sites within the Idaho watershed indicate El-Niño-Southern-Oscillation (ENSO) and the Arctic Oscillation (AO) influence overall snowfall accumulation (measured as snow water equivalent) and timing of snowmelt on annual timescales. Significant snowfall variations exist among different regions in Idaho, where snowfall can be significantly above normal in one region while reduced to half of normal in another. Snow depth and snowmelt timing influences the timing and magnitude of low (high) streamflow events. Using wavelet analysis, we extend historic snowmelt dates and snowfall amounts from regional streamflow data. Extended historic snow data combined with ENSO/AO indexes may predict regional precipitation. Climatically driven variations in snowmelt have implications for Idaho's water supply, hydroelectric generation, wildfire conditions, native fish populations and economy. Future work will address the connection between snowmelt, streamflow, soil moisture, and wildfire in Idaho forests.

### CALPAIN-CLEAVAGE OF $\alpha$ -SYNUCLEIN: CONNECTING PROTEOLYTIC PROCESSING TO DISEASE-LINKED AGGREGATION

*Kristen Leenhouts, Department of Biology;  
Faculty Sponsor: Troy Rohn*

Parkinson's disease (PD) and dementia with Lewy bodies (DLB) are both characterized pathologically by the presence of neuronal inclusions termed Lewy bodies (LBs). A common feature found in LBs are aggregates of  $\alpha$ -synuclein ( $\alpha$ -Syn) and although it is now recognized that  $\alpha$ -Syn is the major building block for these toxic filaments, the mechanism of how this occurs remains unknown. In the present study we demonstrate that proteolytic processing of  $\alpha$ -Syn by the protease, calpain I, leads to the formation of aggregated high-molecular weight species and adoption to a  $\beta$ -sheet structure. To determine whether calpain-cleavage of  $\alpha$ -Syn occurs in PD and DLB, we designed site-directed calpain-cleavage antibodies to  $\alpha$ -Syn and tested their utility in several animal model systems. Detection of calpain-cleaved  $\alpha$ -Syn was evident in mouse models of cerebral ischemia and PD as well as in a *Drosophila* model of PD. In the human PD and DLB brain, calpain-cleaved  $\alpha$ -Syn antibodies immunolabeled LBs and neurites in the substantia nigra. Moreover, calpain-cleaved  $\alpha$ -Syn fragments identified within LBs co-localized with activated calpain in neurons of the PD and DLB brains. These findings suggest that calpain I may participate in the disease-linked aggregation of  $\alpha$ -Syn in various  $\alpha$ -synucleinopathies.

### CHARACTERIZATION OF THE COL11A1 $\Delta$ VR MOUSE

*Erik Linn, Department of Biology; Faculty  
Sponsor: Julia Thom Oxford*

Abnormal skeletal development may contribute to the onset of osteoarthritis later in life. The variable region of type XI collagen is essential for proper cartilage organization and tissue integrity. Transgenic mice were generated by homologous recombination with a Col11a1 targeting gene in which an inverted neomycin-resistant gene interrupted the gene in the region of intron 5 to 13. Immortalized chondrocytes and osteoblasts were generated by crossing a homozygous Col11a1 $\Delta$ VR mouse with a mouse harboring the temperature-sensitive SV40 large T-antigen gene controlled by an interferon- $\gamma$  responsive promoter. Preliminary in vitro chondrogenesis studies using alcian blue staining suggest chondrocytes from homozygous and heterozygous Col11a1 $\Delta$ VR mice produce the proteoglycans necessary for extracellular matrix development. We used immunoblots, alcian blue staining, PCR, and immunohistochemistry to further characterize skeletal development in the Col11a1 $\Delta$ VR mouse. Characterization of the Col11a1 $\Delta$ VR mouse will potentially lead to the development of better diagnostic methods and improved therapeutic approaches for arthritis.

## SEMI INTELLIGENT DRUG DESIGN: MANGANESE COMPLEXES CAPABLE OF REGULATING LEVELS OF REACTIVE OXYGEN SPECIES.

*Bryan Martin, Department of Chemistry  
& Biochemistry; Faculty Sponsor: Jeffrey  
McNamara Peloquin*

A series of manganese complexes based on the 2-bis—(2-pyridylmethyl)-amino)-methyl-4-methylphenol ligand system has been synthesized. Each of the complexes is capable of catalyzing the dismutation of hydrogen peroxide. The complexes differ by the addition of different functional groups to the phenol that are capable of forming hydrogen bonds to hydrogen peroxide bound to the manganese ion. In this report we demonstrate the correlation of hydrogen bonding ability with the catalytic ability of the manganese complex. We also report parallel computational studies that show how the hydrogen bonds affect the transition states of the reaction as well as the Mn=O intermediate. Of particular interest is these computational studies indicate that the addition of carboxyl groups leads to an initial deprotonation of the peroxide substrate prior to the start of the dismutation reaction.

## NEW TARGETS FOR DRUG DESIGN TO FIGHT LYME DISEASE

*Maria Martinez, Department of Chemistry  
Faculty Sponsor: Ken Cornell*

*Borrelia burgdorferi* is the bacterial organism that causes Lyme disease. BgP6 and pfs-3 are two enzymes that have been isolated from this organism. Both enzymes exhibit 5'-Methylthioadenosine / S-adenosylhomocysteine nucleosidase (MTN) activity. To investigate MTN as a

target for antibiotics to fight Lyme disease, the genes for BgP6 and pfs-3 were cloned and expressed as recombinant proteins. The recombinant proteins were examined for enzyme activity against normal substrates. Inhibition studies on BgP6 show that this enzyme is sensitive toward DADMe-ImmA inhibitors, while pfs-3 didn't show the same effects. Studies are underway seeking the ideal conditions that may improve the activity of both pfs-3 and BgP6.

## IDENTIFICATION OF COLLAGEN GENE LOCI IN DANIO RERIO

*Jeremiah Maschmann, Department of  
Biochemistry and Chemistry  
Faculty Sponsor: Julia Thom Oxford*

Zebrafish (*Danio rerio*) have become an increasingly popular vertebrate model organism. Their strengths in developmental research include embryo transparency, ease of genetic crossing, and large breeding numbers. My research has been limited to the elucidation of their collagen-gene loci. Construction of a working map for the location of these genes has been undertaken. Of specific interest, is locating the gene, ColXIa 1. Its necessity is evaluated from its absence, as seen in humans suffering from Stickler Syndrome. After transcription, the RNA undergoes alternative splicing, resulting in at least eight known isoforms. It is therefore important to ask whether or not zebrafish synthesize ColXI and in which forms. Bioinformatic techniques have lead to a proposed location of the gene on chromosome 24. With this information, reagents, including morpholino-oligos, PCR primers, and cDNA probes, have been constructed. Bench analysis of the organism will provide further evidence supporting or refuting this argument.

### BINARY AND TERNARY COMPLEXES INVOLVING SMALL MOLECULES AND CARBONYL REDUCTASE

*Matthew Mayer, Department of Chemistry and Biochemistry; Faculty Sponsor: Henry Charlier Jr.*

Carbonyl reductase (CR) is an enzyme that catalyzes the NADPH-dependent reduction of various carbonyls. CR has been implicated in the cardiotoxic side effect often observed in cancer patients after treatment with anthracycline drugs. The use of anthracyclines is limited by the cardiotoxicity. Given the role of CR in the cardiotoxicity, it is important to fully understand/characterize an enzyme's structure and function. Equipped with such information new treatments may be designed to improve anthracycline chemotherapy. The present study is aimed at examination of how CR binds small molecules, many of which are known inhibitors of CR. Using fluorimetry, the binding of several enzyme-small molecule complexes were studied. NADPH and NADP<sup>+</sup> were found to bind to the free enzyme with  $\mu\text{M}$  affinities. The fluorescent probe, 8-Anilino-1-naphthalenesulfonic acid, was found to bind to the free enzyme and enzyme-NADP<sup>+</sup> binary complex with  $\mu\text{M}$  affinities, but does not inhibit the enzyme as a result of binding.



### THE DEVELOPMENT OF TRANSURANIC AQUEOUS METAL ION SENSOR SYSTEMS

*Noah Minskoff, Department of Chemistry; Faculty Sponsor: Dale Russell*

A new approach in developing environmental sensors for the detection of uranium in groundwater requires a series of organic reactions to achieve a covalent attachment between a binding site and the target molecule. Using electrochemical deposition the polymer is plated onto platinum micro-electrodes. An in situ set of organic reactions were carried out on the polymer surface to allow covalent attachment of 4-sulfonic calix [6] arene hydrate (C[6]A), a uranium binding ring with structure complementary to the uranyl ion ( $\text{UO}_2^{2+}$ ). The polymer is a semi-conductor and the binding of C[6]A to the uranyl ion alters the conductivity of the polymer. The change in conductivity is correlated to the concentration of the uranyl ion present in the ground water being sampled. The polymerized micro-electrode is inexpensive, robust and small with sub parts per billion sensitivity. This has advantages over larger and more expensive methods currently employed to measure heavy metals in ground water.

### DEVELOPMENT OF A MULTI-SPECIES RHODOPSEUDOMONAD H<sub>2</sub> PRODUCING MICROBIAL SYSTEM

*Dana Moracco and Kevin Feris, Department of Biology; Faculty Sponsor: Kevin Feris*

Microbial H<sub>2</sub> production is a viable source of alternative energy. *Rhodopseudomonas capsulata* and *Rhodobacter sphaeriodes* are photoheterotrophic purple non-sulfur bacteria that produce hydrogen gas (H<sub>2</sub>)



when grown anerobically with organic acids and light as carbon and energy sources, respectively. Agricultural wastewater (e.g. potato processing wastewater) contains large amounts of organic acids and often must be treated before disposal at a substantial cost to the producer. Here we 1) explore the ability of these bacteria to produce  $H_2$  in varying concentrations of potato wastewater; 2) develop a specific medium that is compatible to the nutrient and atmospheric requirements of both bacteria; and 3) investigate the prevalence of native hydrogen producing purple non-sulfur bacteria in potato wastewater. Information gleaned from this study will be helpful in developing a microbial system that can convert our agricultural waste into a viable source of alternative and renewable energy.

### MAKING USE OF ORGANIC WASTE: FUEL BRIQUETTE TECHNOLOGY FOR COOKING AND HEATING

*Dana Moracco and Blake Stanhouse,  
Department of Biology; Faculty Sponsor:  
Kevin Feris*

Paper and yard waste represent an accessible and renewable fuel source for household cooking and heating rather than a way to saturate land fills. The current study seeks to establish the caloric content of variable composition mixtures of paper with yard waste and to compare these values against more traditional fuel sources such as wood, wood pellets, and charcoal. Oxygen bomb calorimetry will be used to test the caloric output of compressed pellets made from paper, yard waste, and paper to yard waste mixtures. Subsequent combustion testing of the biomass briquettes will establish the best ratio of paper to yard waste for

use in outdoor cooking and heating. The future goal of this research is to develop environmentally conscientious briquette technology to be used at the household and community level.

### EFFECTS OF LONG-TERM NITRATE AMENDMENT ON LITTER DECOMPOSITION RATES AND MICROBIAL DIVERSITY

*Mariona Nadal, Pam Hess and Kevin Feris,  
Department of Biology; Faculty Sponsor:  
Kevin Feris*

Leaf litter decomposition in first order streams, a microbial mediated process, is a key component of carbon spiraling in these aquatic ecosystems. Eutrophication of stream waters can affect rates of litter decomposition and therefore carbon spiral length. The purpose of this study is to understand how chronically high levels of nitrates affect the microflora colonizing leaf litter in small permanent springs of the Dry Creek watershed. We employ molecular microbial community analysis to assess differences in prokaryotic community composition on decomposing leaf litter in a high nitrate (average  $\sim 1$  ppm  $NO_3^-$ ) and a low nitrate (average  $\sim 200$ - $300$  ppb  $NO_3^-$ ) spring. Relationships between microbial community structure, rates of litter decomposition, and nitrate levels are being evaluated. Based on previous studies we predict that the high nitrate stream will lead to higher microbial activity associated with organic matter decomposition.

### COMPUTATIONAL AND SYNTHETIC INVESTIGATION OF STABILIZED AND NONSTABILIZED AZOMETHINE YLIDES FOR THE GENERATION OF AZACYCLES

*Alina Schimpft, Department of Chemistry  
Faculty Sponsor: Don Warner*



Electrocyclization and cycloaddition of azomethine ylides and azaallyl anions offer potential for regio- and stereocontrolled formation of azacycles. Thus, these reactive

intermediates have been investigated computationally. Specifically, we have studied the properties of conjugated azomethine ylide and azaallyl anion systems that are theoretically capable of undergoing disrotatory electrocyclization due to their six pi electrons. As ring closure is dependent on the geometry of the intermediates, a computational study of conformer energies and interconversion energy barriers has been conducted. Initial studies suggest that intermediates substituted at the four position favor the U-geometry required for electrocyclization. Further calculations indicate that added steric hindrance at this position gives increased bias toward the U conformer while simultaneously lowering the activation energy required for electrocyclization. Related studies have examined the structural properties that facilitate spontaneous ring opening of 4-oxazolines to produce stabilized azomethine ylides. These and other findings will be reported. Supported by PRF/41664-GB1.

### DOES OSM PLAY A ROLE IN COLORECTAL CANCER?

*Tyrell Simkins, Department of Biology  
Faculty Sponsor: Cheryl Jorcyk*

Oncostatin M (OSM) is a pleiotropic cytokine in the interleukin-6 family. OSM has been shown to stimulate the proliferation of some cell types, while inhibiting the growth of others. Our lab is focused on determining the role oncostatin M plays in tumor progression and metastasis in cancer. Using a chemically induced model of colorectal cancer in mice we are investigating the importance of OSM in this disease. By inducing colorectal cancer in normal mice and in mice with the receptor for OSM (OSMR) knocked out, we can compare the difference in tumor number, size, and metastasis. Preliminary results show the chemical induction of cancer to be highly effective. Sufficient numbers of mice are currently being bred. These studies will allow us to gain insight into the role of OSM in colorectal cancer progression.

### SPIROPYRAN DIMER AS A BUILDING BLOCK OF FUNCTIONAL POLYMERS TOWARD PHOTO-SWITCHABLE MOLECULAR MACHINE

*Aaron Vandenbos, Department of Health  
Science; Faculty Sponsor: Tomoko Fujiwara*

A novel photoswitchable polymer system bearing a terminal spiropyran dimer at the end of poly(L-lactide) was prepared. 3, 5-diethynylbenzyl alcohol, to be used as a coupling monomer, was synthesized via a Sonogashira reaction. Azido-spiropyran molecules were prepared by a three-step synthesis from a nitro-spiropyran. The target spiropyran dimer was designed

to possess a benzyl alcohol to serve as a macroinitiator, and two spiropyrans meta to the benzyl alcohol attached with triazole rings formed through click chemistry. Under UV light irradiation the spiropyran dimer changes conformation, producing an increase in absorption in the visible light range (400~600nm) in several solvents. Poly(L-lactide) bearing this molecule might form micelles and nano/micro particles to encapsulate molecules such as drugs, with the unique capability of intelligent release via UV irradiation. Polymers other than Poly(L-lactide) are currently being prepared and investigated with respect to the spiropyran dimer.

## TIN DIOXIDE BASED MAGNETIC SEMICONDUCTING NANOPARTICLES

*Chadd Van Komen, Isaac Combs and Jason Bell, Department of Physics; Faculty Sponsor: William Stanley Smith*

The research goal is to dope semiconducting oxides like SnO<sub>2</sub> with magnetically active transition metals such as Ni, V, Cr, and Mn, to develop theoretically predicted room-temperature ferromagnetism. The synthesis of nanoparticles was carried out using the sol-gel method under appropriate conditions of temperature. The dopant percentages employed were 1%, 3%, 5%, and 10%. Detailed characterization of the nanostructured materials were undertaken using x-ray diffraction, transmission electron microscopy and magnetometry. Stronger ferromagnetic behavior was observed at lower dopant concentration while it became weaker at higher concentrations presumably due to antiferromagnetic interactions. For example chromium doping in tin dioxide displayed a higher saturation magnetization

of  $6.9 \times 10^{-3}$  emu/g at a 2% dopant level, while it is only  $3.8 \times 10^{-4}$  emu/g when taken to 10%. These systematic investigations confirm that transition metal doped tin dioxide is a promising room temperature magnetic semiconductor for spintronic and nanotechnology applications.

## PRODUCTION AND ISOLATION OF LCRV USING A 6X HIS TAG AND NICKEL PURIFICATION

*Sara Wilson and Juliette Tinker, Department of Biology/Pre-Med; Faculty Sponsor: Ken Cornell*

Historical uses of bacteria as instruments of bioterrorism indicate the importance of the development of vaccines to prevent disease caused by potential bioterrorism agents. The CDC defines the plague, caused by *Yersinia pestis*, as a high priority agent. Cholera toxin (CT) from *Vibrio cholerae* and heat-labile toxin (LT) from *Escherichia coli* are adjuvants that induce immune responses to co-administered antigens. Chimeras containing LcrV antigen from *Yersinia* have been developed for use as potential vaccines. The LcrV protein requires purification for use in vaccine studies that compare the immune response induced by the chimera to that stimulated by the LcrV protein alone. LcrV will be isolated from a plasmid containing the lcrV sequence. The plasmid contains a tag for purification of the LcrV protein. Production will be confirmed by SDS-PAGE and Western Blot analysis. The chimera is anticipated to be more effective in inducing an immune response than is LcrV alone.

### CHARACTERIZATION OF COLLAGEN TYPE XI ISOFORMS USING ANALYTICAL ULTRACENTRIFUGATION AND CIRCULAR DICHROISM

*Luke Woodbury, Department of Chemistry  
Faculty Sponsor: Julia Thom Oxford*

Type XI collagen is a minor constituent of the extracellular matrix of many tissues and is essential in the regulation of collagen fibril assembly and diameter. The  $\alpha 1$  chain of Collagen XI contains a variable region that is modulated by alternative splicing in a tissue-specific and developmental manner. Recombinant isoforms were expressed in *Escherichia coli* and purified using affinity chromatography. Purified isoforms were characterized by circular dichroism spectral analysis. The information gained from circular dichroism spectral analysis will help us to understand the secondary structures of the isoforms. Sedimentation characteristics of the isoforms were determined by analytical ultracentrifugation. The information gained from the sedimentation experiments will help us to understand how protein-protein interactions influence fibrillogenesis. Together, these experiments may yield information of significance in the development of therapeutic or preventive strategies for diseases with a fibrotic component such as scleroderma, renal, pulmonary and liver fibrosis as well as radiotherapy-induced fibrosis.



### BENZOTHAZOL INHIBITORS OF CARBONYL REDUCTASE

*Mikhail Zhukalin, Department  
of Biochemistry; Faculty Sponsor:  
Henry Charlier Jr.*

Carbonyl reductase is a NADPH-dependent oxidoreductase enzyme that catalyzes the reduction of several carbonyl-containing compounds. In humans, carbonyl reductase appears to have both protective and deleterious effects. In particular, the action of carbonyl reductase on anthracycline chemotherapy agents is thought to result in generation of cardiotoxic compounds that limit the use of these drugs in cancer treatment. Understanding mechanism of action and inhibitor specificity of carbonyl reductase may provide insight into the development of better anti-cancer agents with more favorable therapeutic profile. In this study, twelve candidate compounds were tested as potential inhibitors of carbonyl reductase. Two compounds, 1,2-benzisothiazol-3(2H)-one and 2-cyano-6-methoxybenzothiazole, were found to be potent noncompetitive inhibitors of carbonyl reductase. These inhibitors bind with low  $\mu\text{M}$  affinities and may possible bind multiple binding sites. Such compounds represent novel inhibitors that could be base structures for the design of more potent and potential therapeutic inhibitors.

INFLUENCE OF LICHEN-DOMINATED  
BIOLOGICAL SOIL CRUSTS ON SEED  
WATER STATUS OF TWO ANNUAL  
GRASSES

Shawna Zimmerman, Department of Biology  
Faculty Sponsor: Marcelo Serpe

The seed water status of *Bromus tectorum* L. and *Vulpia microstachys* Nutt. was analyzed after placing seeds on bare soil, crust containing a variety of lichens and mosses (mixed crust), or crust dominated by *Diploschistes muscorum* (lichen crust). The seed water status was similar on the bare soil and mixed crust and significantly lower on the lichen crust. These differences in water status correlated with differences in germination, which was ten times lower on the lichen crust. To ascertain water was the main factor limiting germination on the lichen crust, we conducted germination tests in an environment with 100% relative humidity. Under these conditions, germination on the lichen crust was similar to that on the bare soil surface. Our results indicate that the lichen crust has a negative effect on seed water status and seed germination. These effects may contribute to the development of patchy vegetation patterns in arid lands.



## College of Business & Economics Poster Presentations

### MAYORS CLIMATE INITIATIVE: BOISE EXPERIENCE

*Robert Warns, Department of Economics  
Faculty Sponsor: Sian Mooney*

On June 13, 2005, the U.S. Mayors Climate Protection Agreement was signed by 10 city mayors in the U.S. Since this time, over 400 other mayors have signed on to this agreement. The general goal of the agreement is to meet or beat the emission reductions of the internationally accepted Kyoto Protocols. This project will conduct economic research into the project and it's actual as well as projected results.

To do this I will research fully into the details of the agreement and analyze the goals and policies of this agreement from an economic prospective. This research will culminate in the creation of a display board, which will be presented at the Undergraduate Research and Scholarship Conference on April 16, 2007.



### INFLUENCE OF COPPER MICROSTRUCTURE ON AGGRESSIVE CHEMICAL MECHANICAL PLANARIZATION PROCESSES

*Patrick Anderson, Department of Materials  
Science & Engineering; Faculty Sponsor:  
Megan Frary*

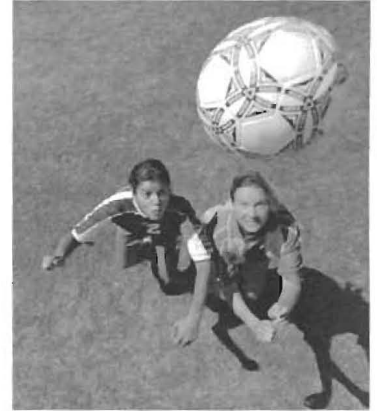
A novel semiconductor packaging technique called 3-D integration enables different components to be consolidated into a single package. Part of creating a 3-D integrated circuit is etching holes that pass completely through the silicon wafer. These through-wafer vias are filled with copper by electrodeposition which completely covers the wafer. The excess copper must be removed from the surface by chemical mechanical planarization (CMP). Aggressive first-step CMP may be required to remove the thick copper overburden. In this research we explore the relationship between the surface orientation of copper grains and local CMP removal parameters using electron backscatter diffraction (EBSD) and atomic force microscopy (AFM) correlation techniques. EBSD is used to map crystal orientation across a large area of the sample, and AFM is subsequently used to determine relative surface heights between grains of known orientation. Current results show a relationship between total grain boundary length and copper removal rate.

### HEADING AND THE IMPACT OF SOCCER BALLS: HUMAN SUBJECT

*Kyle Antonini, Department of Mechanical &  
Biomedical Engineering ; Faculty Sponsor:  
Michelle Sabick*

Despite many case studies done to determine whether soccer ball heading causes musculoskeletal or neurocognitive damage, there is no clear answer.

An analytical model for the impact of an air-filled sphere with a solid sphere has been developed and tested using drop tests on a bowling ball apparatus. To test a real-life situation, balls are shot out of a cannon device, at five different test velocities, in two different ways (goal kick and corner kick) and headed by a player. The player is fitted with a mouth guard containing two 2-axis accelerometers (in the sagittal plane) and a gyroscope, which, assuming the mouth, guard, and skull are a rigid body, can be used to find the forces at any point in the head. The results are recorded in a device in the player's backpack. These readings are then used to find the linear and angular accelerations experienced by the player.



## FLUOROSCOPIC ANALYSIS OF KNEE JOINT KINEMATICS

*Jared Barclay, Brian Griffith and Justin Butterfield, Department of Electrical & Computer Engineering Faculty Sponsor: Elisa Barney Smith*

This project will model the knee joint dynamically in three-dimensions. This involves taking a 3-D Computed Tomography (CT) scanned image and a 2-D Fluoroscopic movie and searching to find the position that matches the two together. The goal is to develop a method for creating a 3-D model of the knee joint in motion. The model would be able to distinguish the Femur, Fibula, Tibia, and Patella. This is accomplished by first segmenting the image to separate the bones and label them. Also, three marker points for reference need to be identified. Mapping these markers will be used to help define a coordinate system between the 3-D Fluoro-coordinates and the bone specific solid model coordinate system. Then markers and a direct linear transform (DLT) will be used to determine the positions of the bones. The position found in the search and the true position can then be compared using the mapping.

## CHARACTERIZATION OF MICROFIBRILS WITHIN THE PERICELLULAR MICROENVIRONMENT OF CHONDROCYTES BY IMMUNOFLUORESCENCE AND ATOMIC FORCE MICROSCOPY

*Kaci Bloxham, Department of Materials Science & Engineering; Faculty Sponsor: Amy Moll*

Collagen is a major component of the newly synthesized pericellular microenvironment of chondrocytes. Within the pericellular matrix, the most abundant collagen is

type II, while collagen types VI, IX and XI constitute a smaller proportion. The collagens cooperate with the cell surface to mediate interactions between the cell, its environment, and proteoglycans of the extracellular matrix to form higher ordered assemblies of hyaline cartilage. The mechanism of assembly of higher ordered complexes is not fully understood. It is believed that type XI collagen may play a role in nucleation of new fibrils, limiting fibril diameter, and may contribute to the stabilization of the cartilage matrix by regulating interactions with extracellular components. In this study, the pericellular matrix of rat chondrocytes was characterized by immunofluorescence and atomic force microscopy (AFM) in an attempt to provide insight into the mechanisms underlying collagen fibrillogenesis.

## ENVIRONMENTAL AND MECHANICAL TESTING OF ZYLON® BICYCLE BRAKE CABLES

*Zak Clark and Gordon Balfour, Department of Materials Science & Engineering Faculty Sponsor: Darryl Butt*

Zylon® or Poly(para-phenylene-2,6-benzobisoxazole) (PBO) is a high tensile strength fiber that is being utilized in a broad range of industries. Previous work has shown that PBO is susceptible to strength reduction under certain environmental conditions. Specifically, exposure to ultra-violet light, humidity, and elevated temperature have all led to a significant (up to 70%) decrease in mechanical strength. The goal of this research is to investigate the chemical or physical cause of strength reduction under these conditions and to test the adequacy of a polymer protective sheath

in preventing the loss of mechanical strength due to this kind of environmental exposure.

### CONSERVATION VOLTAGE REGULATION PROJECT

*David Davenport, Andrei Galushkon and Brett McGee, Department of Electrical & Computer Engineering; Faculty Sponsor: Said Ahmed-Zaid*

One of the biggest costs to utility companies is buying power on the open market at a premium cost when they cannot meet the power demand of the customers. Lowering the voltage during the hours of high demand may conserve energy and save money. The goal of this project is to investigate how household devices react when they are operated at a lower voltage than the nominal 120 volts that is typically distributed to the customers. A number of household devices will be tested with input voltages of 114, 120 and 126 volts. Data will be acquired and analyzed using tools such as a variable voltage source, a data acquisition card, current and voltage transducers and Matlab/Simulink software. The data will be used to calculate powers, fundamental voltage and current, power factor, and harmonics of the waveforms. Preliminary test results show that computer loads (especially monitors) and TVs are constant power loads independent of voltage. The power consumption of lighting and resistive loads varies in a linear relation with the voltage. Since these devices are relatively common, it is expected that the overall power system demand will be decreased with lower voltages.

### A COMPARISON OF TWO IMS'S USED FOR ENVIRONMENTAL MONITORING

*Brandon Duncan, Department of Civil Engineering; Faculty Sponsor: Molly Gribb*

The effects contamination can have on human health, water quality, and the environment make environmental monitoring critical. An environmental probe equipped with an Ion Mobility Spectrometer is being developed by Boise State University to monitor subsurface contamination. In order to support field and lab work in a timely manner, two IMS systems of the same general design have been developed. However, due to small differences in their designs, the data generated from each sensor could not be confidently compared until detailed characterization of each model took place. Various measurements and tests were completed on each IMS to quantify the differences and the effect these differences have on the results. These findings were used to appropriately scale the data sets produced by each IMS. In future work, these results will be used to analyze and compare data from both IMS's.

## FABRICATION OF MOVING PARTS WITHIN AN LTCC STRUCTURE

*Gus Engstrom, Department of Mechanical  
& Biomedical Engineering; Faculty Sponsor:  
Amy Moll*

The variety and complexity of system built using Low Temperature Co-fired Ceramic has increased greatly since its introduction. In the interest of exploring LTCC's flexibility as a building material, development has begun on a process for including moving parts within an LTCC structure. The moving components successfully included within an LTCC structure include gears, pushrods, and fluid propelled rotors. Shafts made of mono-crystalline sapphire have also been included into the structures in conjunction with these components. These shafts have been used to locate, power, and transmit the movement of the encased parts. Several pictures will be presented to illustrate the designs. Data will be presented to characterize the performance of several of the devices. The ability to embed movable features makes the design of complex systems such as compressors, turbines, and other micro-fluidic devices possible. In addition, the integration of these techniques with the electronic capabilities of LTCC provides a method to develop generators and other MEMS applications.

## AN INTRODUCTORY ELECTRICAL ENGINEERING EDUCATION MODULE INTEGRATING BASIC SOFTWARE AND HARDWARE FILTER APPLICATIONS

*Terry Gorseth and Darrin K. Reed,  
Department of Electrical & Computer  
Engineering ; Elisa Barney Smith*

Introducing elementary engineering concepts to perspective students is a difficult challenge. A modular, educational design of both theory and hands-on approach is being investigated to address this problem. Through the implementation of common hardware and software filters, students explore several electrical engineering concepts. First, students use Matlab software to learn basic concepts of filters by applying common filters to pre-recorded audio samples. Through audible inspection students hear the effects of these filters. Secondly, the students verify the previous filter concepts and visualize audio waveforms by probing tangible filters using an oscilloscope. With this interactive and conceptually focused approach, the project module presents engineering concepts in absence of a theory-only fashion. By showing the relationships of everyday applications to fundamental electrical engineering concepts, most students display increased levels of engagement.



### PAYETTE RIVER BRIDGE PROJECT: ENGINEERING WORKS

*Alex Hammond, Don Perkins, Mona Vu,  
Branden Lange, Aleshia Hansen, and Breia  
Alderson; Department of Civil Engineering  
Faculty Sponsor: Robert Hamilton*



The Payette River Bridge Project is located on US 95 in Payette County, Idaho, between Payette and Fruitland. The current roadway system consists of two separate bridges for its northbound and southbound traffic and does not currently support the projected amount of daily traffic. The northbound bridge constructed in 1927 has a sufficiency rating of 24.4 and is two feet lower than the required clearance. It carries one lane, is in poor condition and must now be replaced. The southbound bridge built in 1969, carries two lanes, and has a sufficiency rating of 83.2; however it does not meet current AASHTO standards. Engineering Works will remove the northbound bridge or upgrade it providing pedestrian access for local residents. A new structure and highway alignment will be provided with means for ingress and egress.

### PROTEIN INTERACTION CHARACTERIZATION THROUGH MAGNETIC NANOSPHERE LABELING.

*Jonathan Henderson, Department of  
Mechanical & Biomedical Engineering  
Faculty Sponsor: Janet Hampikian*

This study elucidates the biological interaction between the protein collagen and the nickel binding site (NBS)-protein, a manufactured protein that has a chain of six histidines with a high affinity to nickel. Nickel/ nickel oxide core shell magnetic nanospheres were used to label NBS-protein. The magnetic label was detected by Magnetic Force Microscopy (MFM), an atomic force microscopy (AFM) imaging technique that simultaneously provides spatially magnetic force and height data. The complementary data offers a novel method to gain protein-label information. The goal of this research is to evaluate the strengths and weakness of MFM as a characterization method for protein-protein interactions.

## DEVELOPMENT OF THREE-DIMENSIONAL MICROSTRUCTURAL MODELS

*Luke Hindman, Department of Computer Science; Faculty Sponsor: Megan Frary*

The properties of materials often depend on the structure of the grain boundaries, or interfaces between crystalline regions. While some grain boundaries are susceptible to damage, others resist such damage. In order to study the effects of microstructural variables on mechanical properties, our research has focused on designing computer models to simulate microstructures which will be analyzed in the framework of percolation theory. The first step was to construct a model of simulated grain structures and to analyze their percolation properties in two dimensions (2D); microstructures with four million total grains have been successfully simulated. The next step is to perform the same type of simulations and analysis on three-dimensional (3D) microstructural models. The computational techniques used in both the 2D and 3D versions will be presented here, in addition to results of our simulations. In 3D, simulations of at least one million grains will be possible using parallel computation.

## THE IMPACT OF CRYSTAL ORIENTATION ON OXIDATION AND CORROSION OF POLYCRYSTALLINE NICKEL

*Sharla Hopkins, Department of Materials Science & Engineering; Faculty Sponsor: Megan Frary*

Engineering materials at the microstructural level could increase their resistance to corrosion in harsh environments. The objective of

this research is to determine the effects of orientation on the oxidation and corrosion behavior of metals over all surface orientations. The first step is to characterize the surface of the metal by mapping grain orientations using electron backscatter diffraction (EBSD). After an oxidation treatment, the topography and thickness of the oxide layer are characterized using optical profilometry. By correlating the results from EBSD and the optical profiler, the oxide thickness can be determined for each surface orientation. Our preliminary results demonstrate a distinct correlation between the orientation and the oxide layer; we find that the oxide thickness is correlated to the angular deviation away from the  $\langle 111 \rangle$  orientation. Using this technique, a more fundamental understanding of the role of surface orientation on oxidation behavior can be achieved.

## COMPARISON OF ENERGY TRANSFER TO PROPEL A BALL FROM VARIOUS SPORTS

*Justin Hunter, Department of Mechanical & Biomedical Engineering; Faculty Sponsor: Michelle Sabick*

Many different sports use a pendulous movement of the arm to propel a ball. For example, a professional tennis serve can often top 150 miles an hour traveling a few dozen yards while a professional golf player's swing can attain speeds of around 120 miles an hour and propel a ball hundreds of yards. The purpose of this study is to determine which motion in sports produces the most acceleration on a ball. An analysis will be made using motion capture techniques to calculate and compare the velocity and acceleration of swinging motions of a sample of three sports: a tennis serve, a golf club swing (driver club) and a baseball swing. Maximum speeds and acceleration

contrasted by the mass of the impact instrument will provide a reasonable idea of which swing obtains the greatest potential energy at the impact of the ball.

### EFFECTS OF A BELOW THE KNEE PROSTHETIC ON THE FORCES SUSTAINED WHILE WALKING

*Derek Jackson, Department of Mechanical & Biomedical Engineering; Faculty Sponsor: Michelle Sabick*

A below-the-knee prosthetic may increase the force on the other foot while walking. The purpose of this study is to compare the forces sustained in each foot to determine if the prosthetic functions similarly to a foot and ankle. The study will also compare the forces due to walking with a prosthetic to forces due to walking without a prosthetic to find out what effects the prosthetic has on the weight distribution of each foot. A student with a below the knee prosthetic will repeatedly walk over a force plate to record the reaction forces in each foot. Another student without a prosthetic will also walk over the force plate for comparison. The forces sustained by each of the students will be compared to determine the functionality and the quality of the prosthetic.

### CMP OF ULTRA-THIN DIE

*Austin Johnson, Department of Materials Science & Engineering; Faculty Sponsor: Amy Moll*

A preliminary experiment was conducted to investigate the feasibility of performing CMP on ultra thin die ( $<50\mu\text{m}$ ) mounted on a silicon wafer that has been electroplated with copper. This would ultimately enable wafer level packaging of stacked die, thus reducing the steps necessary to complete a typical

3D stacked die configuration. The starting thickness of the copper covering the surface of the wafer and die was measured and recorded using an automatic four point probe and was found to be approximately  $7500\text{\AA}$ . After polishing for 50 seconds, the copper covering the die had a thickness of  $5500\text{\AA}$ , while the copper covering the wafer remained at  $7500\text{\AA}$ . After a total of approximately four and a half minutes of CMP run time, the copper was removed from the tops of the mounted die while the rest of the wafer remained covered with copper.

### EMBEDDED CATALYTIC CHANNELS IN LOW TEMPERATURE CO-FIRED CERAMICS

*Douglas Kellis, Department of Materials Science & Engineering; Faculty Sponsor: Amy Moll*

The trend towards ever smaller satellites increases the need for miniaturized propulsion devices to control these satellites and the reduced propellant needs to maintain them in low earth orbits. The LTCC medium is fast becoming a product of choice for a variety of different products due to its flexibility in applications. With recent advances in fabrication techniques allowing us to embed micro-channels within monolithic ceramic devices, we believe we can provide inexpensive and reliable micro-propulsion systems. This work will describe the design and fabrication of these multi-layered devices with channel sizes  $0.5\text{mm}$  in width. Three fabrication processes will be detailed including: channel construction using a LASER milling machine, silver paste deposition using a CNC Direct Write tool as well as the use of a sacrificial carbon tape to maintain the channel integrity during lamination.

## THROUGH WAFER INTERCONNECTS IN ACTIVE DEVICE WAFERS

*Mitch Lecertua, Department of Materials  
Science & Engineering; Faculty Sponsor:  
William Knowlton*



The ability to electrically connect the top surface to the bottom surface of the silicon wafer using through-wafer-interconnects (TWIs) allows computer chips to be stacked rather than arranged side-by-side. Demonstration of this technology could allow faster device operation and significant improvements in miniaturization of consumer

products such as cell phones, PDA's, and laptops. The process developed at Boise State is utilized to develop high aspect-ratio interconnects to transistor devices on silicon wafers. Rather than the plug fill method where the vias are entirely filled with copper, current efforts focus on the barrel coat process that only deposits a thin layer of copper on the via walls. Once the copper deposition is complete, the devices are electrically addressed from the backside of the wafer and the initial characteristics of the device are compared to the device characteristics after TWI processing.

## EFFECT OF WRIST PROTECTION ON WRIST FORCE DURING A FALL

*Blake Martin, Department of Mechanical  
& Biomedical Engineering; Faculty Sponsor:  
Michelle Sabick*

Many snowboarders' instincts are to land from a fall with their hands first, often causing major injuries. Many snowboarders

tape their wrists with athletic tape, some use plastic glove inserts, and some use regular gloves as protection. The purpose of this study is to compare the amount of force transmitted to the wrist during a simulated fall in different types of protective gear. Falls will be simulated by dropping a wrist surrogate onto a force platform to determine the amount of force transmitted by each protective option. Three trials will be conducted for each of the options. Based on an analysis of the results and research, the most effective form of wrist protection to withstand the force of the fall and prevent injury will be identified.

## PSOC USB BUS POWERED LI+ BATTERY CHARGER

*Mike Logue, Josh Kiepert, Matt Murdock and  
Cameron Stewart, Department of Electrical  
& Computer Engineering; Faculty Sponsor:  
Robert Hay*

The goal of this project is to create a USB Bus powered Li+ battery charger for a Cypress PSoC reference design kit. This poster presentation should include the theory on Li battery charging as well as a working demonstration if it is completed by then, or at least our progress in creating that demonstration. Also included will be some general information on Cypress' Programmable System on Chip (PSoC) and its advantages over microcontrollers in similar designs.

### LEWANDOWSKI WIND FARM PROJECT

*Michael McKee and Chris Raymes, Department of Electrical & Computer Engineering ; Faculty Sponsor: Said Ahmed-Zaid*

As the need for environmentally sustainable energy sources become more important, wind energy has developed into an attractive



supplement to conventional technologies. The focus of the project is to develop a comprehensive understanding of the functionality

of the main generator and associated controls common to all three wind turbines at the Lewandowski wind farm. The primary intent of the project is to help develop a research based relationship between Boise State University and the wind farm owners. The project will be divided into four tasks. The initial task involves extensive research into the current functionality and hardware configurations of the wind turbine systems. This will be accomplished through site visits, communication with the owners, and researching the details of the hardware components presently used in the systems. The second task requires the modeling of the system hardware components in a software environment. The third task involves the construction of a scaled system model in a laboratory environment. The final task will be the development of a detailed technical document to be provided to the university and the owners.

### SILVER CITY WATER SYSTEM IMPROVEMENTS

*Brenda Morris, Nich Church, Marlene Gallwitz, Chris Melander and John Gunnerson; Department of Civil Engineering; Faculty Sponsor: George Murgel*

Silver City, Idaho is a remote historic mining town located in the foothills of Owyhee County, Idaho founded in 1864. Due to increasing tourism there is a high demand for a larger water system to the town for economic uses and especially fire hazards. Pioneer Engineering will design an additional holding tank of at least 30,000 gallons, a new spring-box for ground-water collection constructed in Statham Spring (Jordan Creek Tributary), and the access road to this spring-box. A new PVC piping system will connect the spring-boxes and tanks to one-another as well as run throughout Silver City, and includes fire-hydrants improvements. A dam will be constructed on Jordan Creek that will create a dipping pool for helicopter dipping buckets in order to assist the Bureau of the Land Management (BLM) in their fighting forest fire efforts and help save the town from a disastrous fire.



## LOW POWER RESISTIVE TAMPER SENSOR

*Joshua Nekl, Patrick Ramson, Ben Fox and Aaron Erbe; Department of Electrical & Computer Engineering; Faculty Sponsor: Jake Baker*

Security devices contain countermeasures to detect intrusion. One intrusion detection mechanism places a resistive mesh around critical components. An attempt to remove the mesh to gain access to the components will break or short the wires in the mesh changing its resistance. The intrusion detection circuit operates on a battery so it is operational all the time. A low power sensor is used to detect changes in resistance and signal a tamper event. Once a tamper is detected, the system can erase sensitive information that resides in memory.

## MAPLE RIDGE ESTATES SUBDIVISION SENIOR DESIGN PROJECT

*Stillman Norton, Richard Allen, Carina Casteneda, Monica Hunter, Trevor Root, Marcus Simons, Brandon Thompson and Ricardo Zavala, Department of Civil Engineering ; Faculty Sponsor: Robert Hamilton*

As part of a senior design course in Civil Engineering, our team will be working on a land development project for the Maple Ridge Subdivision located in Donnelly, Idaho. The project subdivision is a real project that is being developed by a local engineering firm, however the design for this course will in no way impact the actual design of the subdivision. Various components of this project include providing a complete layout of the site, designing and laying out sewer, water, and storm drainage

systems, providing proper site grading, designing all roadways and parking areas, and designing a typical duplex housing unit that will be found in the subdivision. Our poster will highlight these design elements and will provide an overall summary of our design project.

## ELECTRICAL CHARACTERIZATION OF NANOSTRUCTURES

*Antonio Oblea, Curtis Perkins, David Estrada (McNair Scholar), Jason Brotherton, Patrick Price, and David Araujo, Department of Electrical & Computer Engineering; Faculty Sponsor: W.B. Knowlton*

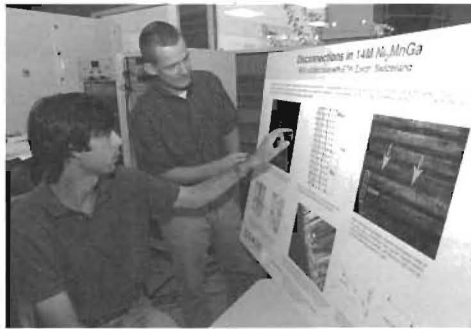
Silicon technology is rapidly approaching its limit. Novel approaches to device engineering are being investigated to develop devices that can interface with or surpass silicon technology. One such approach to device scaling has been undertaken by the Biomolecular Electronics Research Group at Boise State University. This group has been and is currently fabricating electrical test structures at the micron and nanometer scale using electron beam lithography (EBL) techniques. Nanostructures are deposited on these electrical test structures. However, the electrical characterization techniques to fully investigate the applications of these novel devices have not been fully developed. This project is focused on the development of electrical characterization techniques which compliment the efforts of the Biomolecular Electronics Research Group. The goal of this study is to establish a standard set of data for electrical test structures allowing researchers to compare the electrical response of deposited nanostructures while investigating applications for these novel devices.

## TELEMETRIC RADIO INTERFACE

*Corey Reche and Matt Nelson, Department of Electrical & Computer Engineering  
Faculty Sponsor: Scott F. Smith*

Telemetric's T646 line of Micro Remote Terminal Units allows customers to gather Analog and Digital information utilizing discreet inputs and to control devices using relays. This device currently communicates across the CDMA Control channel to Telemetric's Network Operating Center. The Customers (mainly electric utilities)

can communicate with the device via either a web interface or directly from their control System. Currently, a serial protocol is utilized between the main processor and a secondary processor (which is connected to the radio). The radio & secondary processor are located on a daughter board. The goal of this project is to utilize the existing serial protocol and modify the "C" code of the existing secondary processor (Microchip PIC 18F family) to communicate with a new radio that supports the GSM/GPRS network.



## CHARACTERIZING TWIN STRUCTURE AND MAGNETIC DOMAIN STRUCTURE OF NI-MN-GA USING ATOMIC FORCE MICROSCOPY

*Matthew Reinhold, Department of Materials Science & Engineering ; Faculty Sponsor: Peter Mullner*

Ni-Mn-Ga is a ferromagnetic shape memory alloy that deforms by twin boundary motion. Deformation can be induced through a mechanical load or

through a suitable magnetic field. A thermo-mechanical treatment is used to create twin boundaries and align the short crystal axis of the unit cell perpendicular to the surface. The twin structure was characterized using atomic force microscopy (AFM) to obtain the surface relief caused by twinning. Magnetic force microscopy (MFM) was used to find the magnetic axis of each twin. The combination of AFM and MFM results lead to the complete crystallographic characterization of the twin microstructure.

## THE EFFECTS OF ROPE MATERIAL ON MUSCLE ACTIVATION WHEN SPEED JUMPING

*Lee Reisig, Department of Mechanical & Biomedical Engineering ; Faculty Sponsor: Michelle Sabick*

In competitive jump rope, one of the most essential skills is single rope speed jumping. The purpose of this study is to determine the muscle activity in the wrists required to turn 3 different types of rope at a constant speed in order to determine the most efficient rope for this event. One jumper will jump 30 seconds of the speed step at a 280 jumps per minute pace while the radial and ulnar deviation is monitored. Each rope will be tested in this manner for three trials to determine a mean value for each rope. These averages will be compared to determine the most efficient rope to use for single rope speed events.



### CORRELATING DEGRADATION MODELS AND IMAGE QUALITY METRICS

*Darrin Reed, Department of Electrical & Computer Engineering ; Faculty Sponsor: Elisa Barney Smith*

OCR often performs poorly on degraded documents. One approach to improve performance is to determine a good filter to improve the appearance of the document image before sending it to the OCR engine. There are several features, called quality metrics, commonly measured in the document image to determine what type of filtering would most likely improve the OCR response for that document image. In this project, those same quality metrics are measured for several word images degraded by known parameters in a document degradation model. The correlation between the degradation model parameters and the filter features is measured. High correlations do appear in many places that were expected. They are also absent in some expected places and offer a comparison of quality metric definitions by different authors.

### EFFECTS OF LEVEL OF MARTIAL ARTS TRAINING ON PEAK FORCES DELIVERED FROM A PUNCH

*Travis Steele, Department of Mechanical & Biomedical Engineering ; Faculty Sponsor: Michelle Sabick*

Large forces delivered from a straight punch are the cause of many facial injuries in fighters. The purpose of this study is to compare the peak horizontal forces generated by three fighters with varying amounts of martial arts training, to determine if a highly trained fighter

is more likely to cause injuries. A male undergraduate student with no martial arts training will be fitted with an accelerometer and punch a standing target (punching bag) five times. High speed video will record each punch to determine average and instantaneous punch velocity at the target. The experiment will be repeated by intermediate and professional level male undergraduate students. Impulse-momentum will be used to estimate average punch force delivered. These will be compared statistically to determine whether facial injury is more likely to be caused by a trained fighter.

### SILVER CITY WATER SYSTEM IMPROVEMENTS

*Kristi Unholz, Russell Chatterton, Eric Swander, Kevin Gallivan and Scott Prillaman; Department of Civil Engineering Faculty Sponsor: George A. Murgel*

The water system in historic Silver City, Idaho must be improved to meet increasing water demands from tourism and to provide additional water for the fire system. To meet these demands, we will examine four major areas of improvements. The first will be tapping a new spring and installing an additional water tank. The second area will be the reconstruction of a rock wall dam to create a dipping pond



to aid in wildfire suppression. The third area on which we will focus is improvements to existing fire hydrants to provide winter freeze protection. Fourth is a supplementary backup system to aid in fire suppression should the current water system fail or run dry during a fire. Access roads and power, as there is no electricity, must be accounted for in all of these areas to complete the designs.

### US-95, PAYETTE RIVER BRIDGE

*David Weeks, Liz Brown, Kevin Kuther, Bradley Ortman, Justin Schwalbe and Sajonara Tipuric*  
Department of Civil Engineering;  
Faculty Sponsor: Mandar Khanal

The current bridge crossing the Payette River between Fruitland and Payette, Idaho is outdated and insufficient. The bridge has only a single lane for northbound traffic, while the southbound lane has two lanes. Our group proposes to redesign the existing southbound bridge to incorporate two lanes of traffic flowing in both directions, while addressing safety concerns for turning traffic and pedestrians. The work will include the engineering of foundation, bridge and road design. This design will satisfy the requirements proposed by the faculty of Boise State University Civil Engineering Department and the Idaho Department of Transportation. Completion of our design will be the first step in easing congestion, increasing the level of service and improving the safety of US Highway 95.

### POST-BONDING AND FABRICATION OF LOW TEMPERATURE CO-FIRED CERAMIC

*Hope Weston, Department of Mechanical & Biomedical Engineering; Faculty Sponsor: Amy Moll*

Multilayer devices made from LTCC are a challenge to fabricate because of the many layers involved in the structure of the device. The need for a larger device came from an ion mobility spectrometer (IMS) that needed to be longer in length for "time of flight" of the ions to increase. The idea was to hermetically bond the device with strength and to bridge the electrical connections across the bond. A glass encapsulate paste made by Dupont was used to bond together two 192 layer post-fired drift tubes used in the IMS. The miniaturization and lengthening of the drift tube has resulted in approximately 50 conductive rings in one centimeter. Before the drift tube was completed many tests were conducted to determine the best firing time and temperature. Tests of the conductivity, leaks, and bonding strength were also performed. Several images will be presented to illustrate the post-fired bonding process. This glass encapsulate process could also be used to embed other elements inside of cavities, bonding of very small systems, and to improve the development of other devices.

## SYNTHESIS OF BULK NANOCRYSTALLINE NICKEL BASED ALLOYS

*C. Kimo Wilson, Markus Chmielus, and Nikki Kucza, Department of Materials Science & Engineering; Faculty Sponsor: Peter Müllner*

Nanocrystalline metals have grains on the order of 10-100nm in size. These nanocrystalline alloys possess favorable mechanical properties, such as a combination of high strength and good ductility. Their magnetic properties and electric properties are also favorable. It has been shown that both the Ni-W and Ni-Fe systems produce these nanocrystalline size grains. The tungsten or iron migrate to the nickel grain boundaries, and keep them from growing. These small grains are usually formed through electrodepositing the alloy. We want to find a process to produce large quantities of a nanocrystalline nickel based alloy, stable at room temperature. We will develop a process of cold-rolling and folding cycles, then short heat treatments, that diffuse the Tungsten or Iron in the Nickel. These alloys will then possess the stable nanocrystalline grains. To date we have shown that the rolling and heating of two metals induces bonding and diffusion. The aim of this project is to achieve a grain size below 100nm through repeated fold and roll cycles and intermittent heat treatments.

## PC BASED OSCILLOSCOPES

*Aaron Wozniak and Victor Kelley, Department of Electrical & Computer Engineering; Faculty Sponsor: Bob Hay*

The oscilloscopes in the College of Engineering labs are aging, and some are not functioning optimally. In the past, stand alone oscilloscopes have been the only solution available. These were, and continue to be very expensive. Since these oscilloscopes are stand alone, exporting data or a visual representation (screen shot) of a waveform requires the use of an Ethernet port or a 3.5" floppy disc, a method of data storage which is quickly becoming obsolete. The operating systems on these oscilloscopes are also old and most are Windows 95 based. Updating the operating systems is not an option since the hardware was not designed to work with the currently available operating systems. The senior design team is responsible for researching alternatives to replacing these oscilloscopes either with new oscilloscopes or with a PC based data acquisition solution.



### COMPARING SLOW-FLOW P-V LOOPS ON MECHANICAL VENTILATORS

*Rebecca Brollier and Lacey Matteson,  
Department of Respiratory Care  
Faculty Sponsor: Lonny Ashworth*

Background: The purpose of this study was to compare the automated, slow-flow P-V loops of three different ventilators when connected to an electronic breathing simulator.

Method: Each ventilator was connected to a lung simulator. Pressure and flow were measured, volume was calculated and the pressure-volume loop graphed using a spreadsheet. Ten breaths were delivered between each P-V loop maneuver; this was repeated three times on each ventilator.

Results: During inspiration the P-V loop using all three ventilators had similar tracings. During expiration the tracings on the ventilators were not similar.

Conclusion: Performing slow-flow P-V loops with the electronic lung simulator using different ventilators produces varying results. There were obvious differences when P-V loops were performed with slow-flow only during inspiration; these maneuvers showed a noticeable energy loss on exhalation.

### INNOVATIVE IDAHO STRATEGIES INVOLVING NURSING RECRUITMENT AND RETENTION

*Adam Duchek and Komal Mehrotra  
Department of Community and  
Environmental Health  
Faculty Sponsor: Bonnie Lind and Sarah Toews*

A survey, conducted with the support of the State Office of Rural Health and Idaho Alliance of Leaders in Nursing, was sent to Chief Nursing Officers (CNO) at all 44 Idaho hospitals. The questionnaire was designed to gather information on nursing recruitment and retention strategies for use by hospital administrators and policy makers. A web-based questionnaire was distributed. A response rate of 50% (21 of 42) was obtained with hospitals from all regions of the state represented. The majority of respondents indicated high levels of satisfaction with the retention and recruitment strategies they had utilized. The following five categories of enhancement strategies were identified; salaries and benefits, empowerment, education, workplace environment, and scheduling. The retention and recruitment of nurses is a significant issue. Hospitals recognize the value of the nursing workforce and are implementing innovative strategies to address this challenge.

### EFFECT OF ALTITUDE ON PEAK INSPIRATORY PRESSURE AND TIDAL VOLUME DURING PRESSURE-TARGETED A/C USING THE LTV 1000 AND HT 50

*Denise Y. Chase and Susan Marmementini,  
Department of Respiratory Care  
Faculty Sponsor: Lonny Ashworth*

**Background:** During pressure-targeted A/C, the peak inspiratory pressure (PIP) should remain constant. The PIP and tidal volume (VT) at various altitudes were evaluated using the Pulmonetics LTV 1000 and the Newport HT 50.

**Method:** The testing altitudes were 2938, 5600 and 8890 feet. Each ventilator was connected to the Hans Rudolph Electronic Breathing Simulator (HR 1101). HR 1101 settings: Resistance ( $R_{aw}$ ) 5, 15 and 25 cm H<sub>2</sub>O/L/sec; Compliance ( $C_{st}$ ) 20, 40, 60 and 80 mL/cm H<sub>2</sub>O. LTV 1000 and HT 50 settings: Pressure-Targeted A/C; Rate 8/minute; Pressure 25 cm H<sub>2</sub>O; PEEP 5 cm H<sub>2</sub>O; T<sub>i</sub> 1.0 second. PIP and V<sub>T</sub> were the average of five breaths as the altitude, compliance and resistance were changed. Recorded values were: LTV 1000 displayed values (LTV), HR 1101 measured values with the LTV 1000 (HR-LTV), HT 50 displayed values (HT), and HR 1101 measured values with the HT 50 (HR-HT).

**Results:** Peak inspiratory pressure with a  $C_{st}$  of 40 mL/cm H<sub>2</sub>O and  $R_{aw}$  of 15 cm H<sub>2</sub>O/L/sec: at 2938 ft LTV 25.0 cm H<sub>2</sub>O, HR-LTV 24.9 cm H<sub>2</sub>O, HT 28.0 cm H<sub>2</sub>O and HR-HT 26.8 cm H<sub>2</sub>O; at 5600 ft LTV 26.8 cm H<sub>2</sub>O, HR-LTV 26.4 cm H<sub>2</sub>O, HT 28.4 cm H<sub>2</sub>O and HR-HT 26.7 cm H<sub>2</sub>O; at 8890 ft LTV 27.0 cm H<sub>2</sub>O, HR-LTV 27.0 cm H<sub>2</sub>O, HT 29 cm H<sub>2</sub>O and HR-HT 26.2 cm H<sub>2</sub>O.

Tidal volume with a  $C_{st}$  of 40 mL/cm H<sub>2</sub>O

and  $R_{aw}$  of 15 cm H<sub>2</sub>O/L/sec: at 2938 ft LTV 621 mL, HR-LTV 655 mL, HT 669 mL and HR-HT 581 mL; at 5600 ft LTV 592 mL, HR-LTV 652 mL, HT 661 mL and HR-HT 579 mL; at 8890 ft LTV 557 mL, HR-LTV 662 mL, HT 654 mL and HR-HT 599 mL. There was a similar trend as compliance and resistance were changed at each altitude.

**Conclusion:** The change in altitude had little effect on PIP as compliance and resistance were changed. PIP should remain constant, but should still be monitored while ventilating patients in pressure-targeted ventilation. Tidal volume is affected by altitude with some ventilators at different compliance and resistance, while ventilating in pressure-targeted A/C.

### COMPARISON OF TIDAL VOLUME USING ADULT VS PEDIATRIC CIRCUITS DURING VOLUME-TARGETED, ASSIST-CONTROL WITH THE LTV 1000: IS IT REASONABLE TO STOCK ONLY ONE CIRCUIT?

*Eric Peart and Phillip Elle, Department  
of Respiratory Care; Faculty Staff: Lonny  
Ashworth*

**Background:** Due to the limited available space on an emergency transport vehicle, the space must be used as efficiently as possible. Having an adult and pediatric circuit may not be necessary. Displayed and measured tidal volumes, with adult and pediatric circuits, were evaluated.

**Method:** The Pulmonetics LTV 1000 was connected to the Hans Rudolph Electronic Breathing Simulator (HR1101). Delivered tidal volumes were evaluated while compliance and resistance were changed. Measured delivered volume was recorded with the HR1101.

Results: At a compliance of 40 cmH<sub>2</sub>O with varying resistance, the LTV 1000 delivered similar volumes of 100, 500, and 900 mL with the adult and pediatric circuits.

Conclusion: The adult and pediatric circuits deliver similar volumes while using the LTV 1000. Although both circuits delivered similar volumes to the electronic lung simulator, additional evaluation on patients should be performed before stocking a single circuit on a transport vehicle.

#### EFFECT OF ALTITUDE ON TIDAL VOLUME AND PEAK INSPIRATORY PRESSURE DURING VOLUME-TARGETED A/C USING THE LTV 1000 AND HT 50

*Susan Marmentini and Denise Chase,  
Department of Respiratory Care  
Faculty Sponsor: Lonny Ashworth*

Background: During volume-targeted A/C, the delivered tidal volume ( $V_t$ ) should remain constant regardless of altitude. The  $V_t$  and peak inspiratory pressure (PIP) at different altitudes were evaluated using the Newport HT 50 and the Pulmonetics LTV 1000.

Method: The testing altitudes were 2938, 5600 and 8890 feet. Each ventilator was connected to the Hans Rudolph Electronic Breathing Simulator (HR 1001). HR 1101 settings: Resistance ( $R_{aw}$ ) 5, 15 and 25 cm H<sub>2</sub>O/L/sec; Compliance ( $C_{st}$ ) 20, 40, 60 and 80 mL/cm H<sub>2</sub>O. LTV 1000 and HT 50 settings: Volume-Targeted A/C; Rate 8/minute; Tidal Volume 600 mL; PEEP 5 cm H<sub>2</sub>O;  $T_i$  1.0 second. Tidal volume and PIP were the average of five breaths as the altitude, compliance and resistance were changed. Recorded values were: LTV 1000 displayed values (LTV), HR 1101 measured values with the LTV 1000 (HR-LTV), HT

50 displayed values (HT) and HR 1101 measured values with the HT 50 (HR-HT).

Results: Tidal volume with a  $C_{st}$  of 40 mL/cm H<sub>2</sub>O and  $R_{aw}$  of 15 cm H<sub>2</sub>O/L/sec: at 2938 ft LTV 552 mL, HR-LTV 588 mL, HT 596 mL and HR-HT 529 mL; at 5600 ft LTV 558 mL, HR-LTV 615 mL, HT 595 mL and HR-HT 546 mL; at 8890 ft LTV 561 mL, HR-LTV 670 mL, HT 599 mL and HR-HT 552 mL. Peak inspiratory pressure with a  $C_{st}$  of 40 mL/cm H<sub>2</sub>O and  $R_{aw}$  of 15 cm H<sub>2</sub>O/L/sec: at 2938 ft LTV 23.6 cm H<sub>2</sub>O, HR-LTV 23.6 cm H<sub>2</sub>O, HT 26.4 cm H<sub>2</sub>O and HR-HT 24.8 cm H<sub>2</sub>O; at 5600 ft LTV 25.0 cm H<sub>2</sub>O, HR-LTV 25.6 cm H<sub>2</sub>O, HT 26.0 cm H<sub>2</sub>O and HR-HT 25.2 cm H<sub>2</sub>O; at 8890 ft LTV 27.4 cm H<sub>2</sub>O, HR-LTV 27.7 cm H<sub>2</sub>O; HT 26.0 cm H<sub>2</sub>O and HR-HT 25.4 cm H<sub>2</sub>O.

Conclusion: With an increase in altitude the tidal volumes and peak pressures may increase, depending upon the ventilator. Tidal volumes and peak inspiratory pressures should be carefully monitored during transportation at different altitudes.

### EVALUATION OF F<sub>1</sub>O<sub>2</sub> DURING CONTINUOUS POSITIVE AIRWAY PRESSURE WITH FULL FACE MASKS ENTRAIMENT LOCATION

*Eric Peart and Ty Barnettt, Department  
of Respiratory Care; Faculty Sponsor:  
Lutana Haan*

Background: Home-use CPAP machines deliver set pressures using room air oxygen concentrations of 21%. Supplemental oxygen can be bled into a mask port or a port near the machine. These two methods were compared with several pressures and with O<sub>2</sub> flowrates of 1, 3, 6 and 8 liters per minute, using two different full face masks. Method: ResMed VPAP III was interfaced with standard 6' tubing to a mask placed on a mannequin that was attached to the Hans Rudolph Breathing Simulator. The Hudson RCI percent O<sub>2</sub> oxygen analyzer was used. Results: We found that the oxygen concentration is higher when it is connected at the CPAP port with pressures of 5 to 15. At pressures of 20 the F<sub>1</sub>O<sub>2</sub> was very similar. Conclusion: Bleed in location does affect the oxygen concentration delivered. Mask selection and pressure levels also effect oxygen concentrations. Oxygen should be carefully monitored when CPAP is applied.

### BIRD FLU BUSINESS CONTINUITY MANAGEMENT SYSTEM

*Karl Schultz, Fawn Setler, Leah Arnold, and  
Kimberly Johnson; Department of Community  
and Environmental Health; Faculty Sponsors:  
Uwe Reischl and Newell Gough*



The World Health Organization (WHO) and the U.S. Centers for Disease Control and Prevention (CDC) anticipate that the Bird Flu will reach the United States in the near future. The potential health and economic consequences can be far reaching. Assisting local companies in the development of business continuity plans may help protect the social and business infrastructure during such a pandemic. A new analysis tool has been developed for this purpose. The model allows companies to estimate the impact of a Bird Flu pandemic on their ability to continue business operations. The model considers core corporate business functions, the identification of main operational tasks associated with each of these functions, and the allocation of specific personnel to each task. The tool is available in a "table top" format including process flow-diagrams drawn onto a display board. The presentation will illustrate the strategic and logic contained in the business continuity management tool.

### TELEHEALTH TECHNOLOGY PLATFORM TO FACILITATE DIAGNOSIS AND TREATMENT OF AUTISM

*Ron Schmaltz, Department of Community  
and Environmental Health; Faculty Sponsor:  
Uwe Reischl*

Autism is one of the fastest growing and most prevalent childhood disorders in the United States. Autism is a neurological disorder that interferes with normal development of language, social interaction, and generates odd and sometimes detrimental behaviors. Many children are unable to communicate their needs using spoken words. They can experience hyperactivity, self-injurious behavior, sleep problems, eating disorders, and gastrointestinal symptoms. Early diagnosis and intense treatment is important in supporting children with autism. Unfortunately, there are only few qualified and experienced healthcare providers in Idaho who specialize in autism diagnosis and treatment. Waiting times to obtain clinical appointments can range between 6 and 18 months. Application of a new telehealth communication platform utilizing video capture technology now allows access to qualified healthcare professionals nationwide. This will allow children with autism to be diagnosed and treated more quickly in the future.

### USING PATIENTS TO GUIDE CARE: RESULTS OF A PATIENT SATISFACTION SURVEY

*Susan Tooke and Kathryn Quinn, Department  
of Community and Environmental Health;  
Faculty Sponsor: Lee Hannah*

This study examined patient satisfaction at St. Benedict's Family Medical Center (SBFMC), comprised of one hospital and three clinics. SBFMC conducted a 3-month patient satisfaction survey in December 2005. All patients were asked to complete a 18-question survey regarding their visit. Satisfaction questions utilized a Likert scale, with a range from 1 (Not at All satisfied) to 6 (Highly satisfied). Comparisons were made between location, type, and reason for service, and overall satisfaction. 674 completed surveys were analyzed. The mean satisfaction score of all questions was 5.21, indicating that overall, patients were highly satisfied. Satisfaction by location indicated that those who received services at the Wendell Clinic were most likely highly satisfied (86%). Patients whom chose surgery as the type of service received were the most satisfied (85%) when compared to other service types. Results of this study allowed SBFMC to see where they are successful and areas needing improvement.



### YOUNG ADULT POPULATION DIFFERENCES BETWEEN CAREGIVERS AND NON-CAREGIVERS: LIFE CHOICE OPPORTUNITIES AND OBSTACLES

*Ajsa Bektic Department of Psychology  
Faculty Sponsor: Eric Landrum*

Although little is known about young adult caregivers (ages 18 to 25), they comprise approximately 3.6 million to 5.5 million of total caregivers in the United States (Levine, Hunt, Halper, Hart, Lautz, & Gould, 2005). Young adult caregivers are fragile because they are in a critical developmental stage for future adulthood, and researchers need to help explain how young adult caregivers deal with their own social and emotional development. This research compares young adult caregivers and young adult non-caregivers in their life opportunities (education, employment, social life, etc.). This research was conducted with 60 undergraduate students enrolled in General Psychology during Spring 2006. Results indicate a significant difference between students' perceptions of young adult caregivers and young adult non-caregivers on their ability to choose between caregiving and other life callings, and perceptual differences in limitations to their educational, employment, social, and other aspects of adult life. Findings of this study demonstrate that young adult caregivers may be facing challenges in the upcoming years related to their caregiving work.

### SUITS AND SANDWICHES: EFFECTS OF MATERNAL EMPLOYMENT

*Mariko Downs and Lane Ranestrom,  
Department of Communication  
Faculty Sponsor: Laurel Traynowicz*

The current study investigated behavioral and relational communicative differences in families with either an employed or at-home mother. One hundred surveys of university students (split equally between male and female) and 10 in-depth interviews of mothers (five employed and five at-home) provided retrospective and current self-report data on family habits, behaviors and communication. Descriptive statistics and thematically-grouped interview responses indicated that maternal employment had no effect on the relationship between mother and child. Certain intriguing research anomalies were found regarding self disclosure and disciplinary style. Results are discussed in context of the additional finding, corroborated by Heilman and Martell (1986), that "stereotypes about women are deeply held and resistant to change."

### WEB-BASED ALCOHOL INTERVENTIONS FOR MANDATED COLLEGE STUDENTS

*Lisa McKinley, Department of Psychology  
Faculty Sponsor: Diana M. Doumas*

Research supports the use of brief computerized interventions to decrease high-risk drinking in college students. The goal of this study is to extend the application of these strategies to sanctioned students by evaluating two brief computerized interventions in 45 college students cited with alcohol policy violations. Students completed questionnaires at both baseline and 30-day follow-up sessions to assess alcohol use and related consequences. Participants were randomized into one of two computerized interventions: a personalized feedback program (PFP) and an educational program (EP). Results of paired t-tests indicate significant decreases in total weekly drinking and the experience of negative alcohol-related consequences from pre-intervention to post-intervention for the whole sample. Results also indicate a trend toward larger reductions in drinking in the PFP condition. These findings have important applications for university programming. Specifically, results support the use of web-based feedback as an early intervention strategy for students cited with alcohol policy violations.

### LATTER-DAY SAINTS CHILDCARE NETWORKS IN BOISE, IDAHO

*Student: Kersti Harter, Department of  
Anthropology; Faculty Sponsor: John Ziker*

This study of Mormon childcare networks examines four evolutionary models that have been proposed to account for costs related to devout religious behavior: signaling, inclusive fitness, reciprocal altruism, and tolerated theft. The project studies how the Mormon community has created a strong network of shared childcare. The goal of this project was to identify variables that influence women's decisions to participate in these collectives. The methods used include key informant surveys and network analysis using a version of snowball sampling method called Respondent Driven Sampling. Over thirty women were interviewed and preliminary findings point toward reciprocal altruism. It appears that women who are close in age and who live in the same neighborhood are babysitting for each other several hours a few times a week. This allows the women to have breaks for personal activities including volunteering in the schools and shopping.



### ADULT ATTACHMENT AND THE ACCEPTANCE AND PERPETRATION OF PARTNER VIOLENCE

*Lisa L. McKinley and Melissa Pullin,  
Department of Psychology  
Faculty Sponsor: Mary Pritchard*

Research has identified a link between adult attachment style and the perpetration of intimate partner violence (Mayseless, 1991). Further, attitudinal acceptance of violence is a risk factor for involvement in relationship violence (Simon et al., 2001), yet little research has examined the role of attachment in acceptance of violence. The current study clarified associations between attachment style and both intimate violence perpetration and attitudinal acceptance of partner violence. Measures of attachment, attitudinal acceptance of violence, and perpetration of emotionally and physically abusive behaviors toward their current partner were completed by 287 students. Correlational analyses indicated adults with avoidant attachment styles are more accepting of partner violence, and for men, being higher in avoidance is associated with more abusive behaviors in their relationships. These findings have important clinical implications, indicating that therapy focused on reducing avoidant beliefs would be indirectly effective in reducing relationship violence.

### THE LATE NIGHT EFFECT: POLITICAL KNOWLEDGE AND PARTICIPATION THROUGH PARODY

*Wayne Rysavy, Gretchan Heller, Megan Nagel,  
Ben Bishop, and Lauren Taylor  
Department of Communication  
Faculty Sponsor: Laurel Traynowicz*

While most news media typically follow the standard role of reporting and monitoring the happenings around the world, the newest form of “news,” political parody, employs satire to discuss current events and the political sphere in a humoring discourse. In challenging the norm of news, shows like Saturday Night Live, The Daily Show, and, more recently, The Colbert Report, buck the trend by not only informing the populace but also through entertaining the public. Our study determined the extent to which these shows aided or detracted from political knowledge and participation. We asked two research questions:

RQ1: To what extent do satirical news shows affect voter behavior?

RQ2: To what extent is political knowledge increased as a result of watching satirical news shows?

Results indicate that individuals surveyed believed they were not influenced by political parody shows. Individuals reported feeling largely neutral regarding the impact parody shows have on American society. These results were considered in context of the potential fallibility of self-report measures, as well as the political climate in which these largely Democratic and Independent voters reside.

## MOTIVATIONS AND CHALLENGES IN THE BOISE RUN/WALK GROUP

*Adam Torres (McNair Scholar), Department of Psychology; Faculty Sponsor: Mary Pritchard*

Researchers examined participant's motivations for joining a local run/walk group. There were a total of 82 (females = 75, males = 7). Majority of participants were Caucasian (Caucasian = 72, African-American = 1, Asian = 3, Hispanic/Latino = 3, Other = 2). Participants were asked to identify their top three stressors, which were work, body image, and money. Questions concerning regular exercise within the last six months showed that the majority of participants did exercise. When asked to report the behavior they would most like to change, most reported increasing physical health and nutritional habits. When asked to report benefits of this change, most reported better mood, reduced stress, happier with appearance, increased physical health and energy. Researchers also asked participants to report short-term goals, selected strategy for achieving goals, obstacles, solutions for overcoming obstacles, and rewards for accomplishing their goal.



## RELATIONSHIPS BETWEEN SELF-ESTEEM, PERCEIVED ACADEMIC ABILITIES, AND INTENDED COLLEGE ATTENDANCE.

*Adam Torres (McNair Scholar), Christy Zenner, Daina Benson, Sarah Harris and Tim Koberlein; Department of Psychology Faculty Sponsor: Mary Pritchard*

There are many factors impacting student's decisions to attend college. Researchers investigated self-esteem, perceived academic abilities, and intended college attendance in a group of high school seniors involved in a program aimed at assisting them in getting into college. Participants were 83 senior high school students (males = 28, females = 55) from various high schools in Idaho. Many students come from low socioeconomic backgrounds and the majority were Caucasian (Caucasian = 40, Latino = 28, Asian = 6, African American = 2, and other = 6). Participants were asked 39 questions concerning intended college attendance, self-esteem, perceived academic abilities, and other factors that influenced their decision to attend college. Significant correlations were found between perceived academic abilities and self-esteem.

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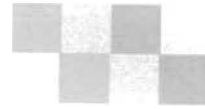
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## Notes



